MACHINERY

DESIGN — CONSTRUCTION — OPERATION

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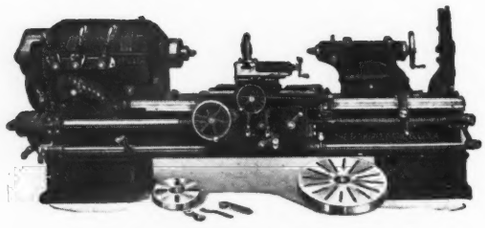
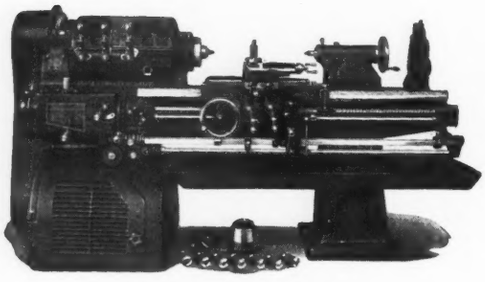


Engine Lathes 12" to 60"



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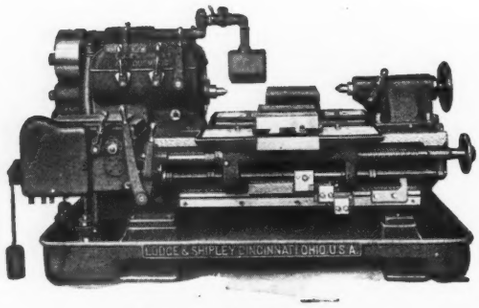

Duomatic Lathes

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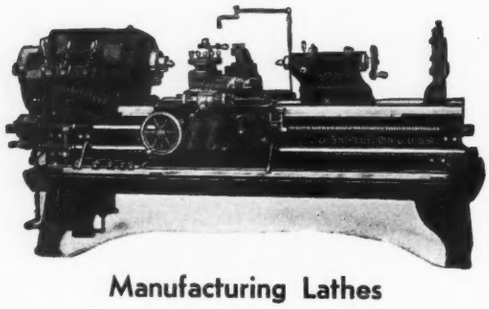


Manufacturing Lathes

From first sketch to finished machine, Lodge & Shipley Lathes are built with the problem of the user in mind. Nothing has been overlooked that will make for the highest type of lathe work.

MACHINERY

Volume 40 NEW YORK, JANUARY, 1934 Number 5

1934 Will See Great Advances in Broaching

Recent Trends Indicate that up to the Present Time Broaching Practice Has Been in its Infancy

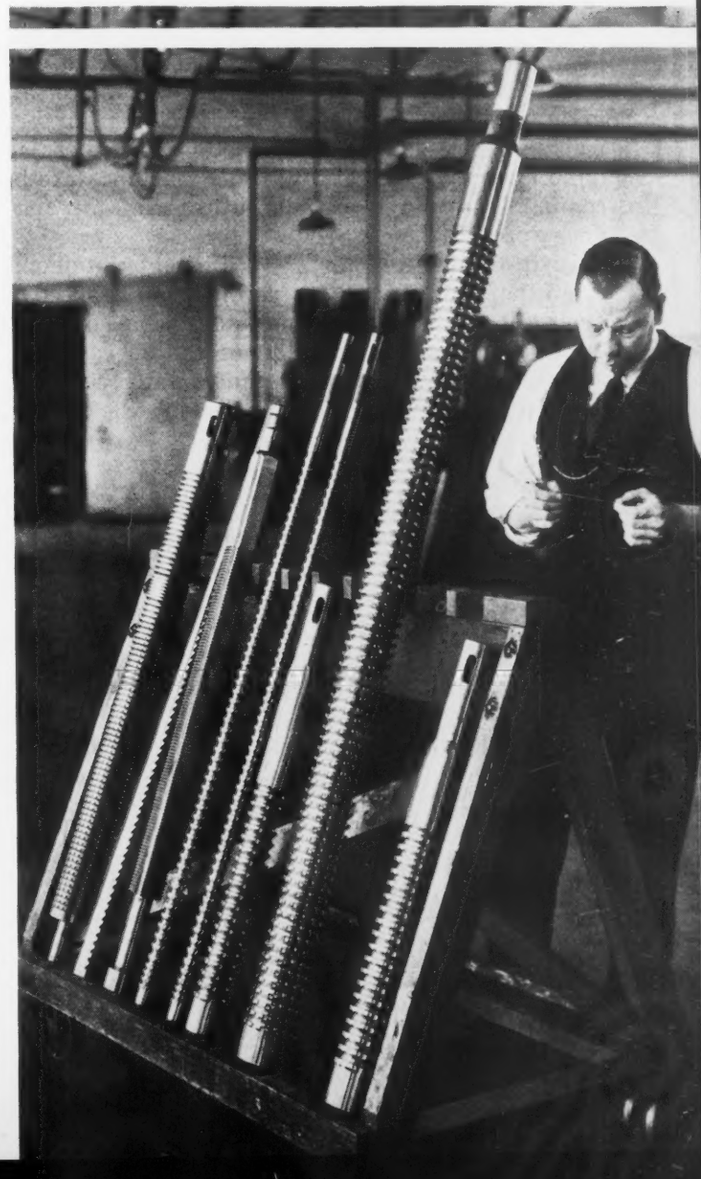
By GUSTAV VON REIS
Engineer in Charge of Broach Division
Ex-Cell-O Aircraft & Tool Corporation, Detroit, Mich.

IMPORTANT strides are being made at the present time in broaching practice, especially in the field of external or surface broaching, where its possibilities appear to be almost unlimited. One automobile manufacturer has tooled up for broaching cylinder blocks on the top, and in all probability, the same machining process will be used for other flat surfaces on the bottom, sides, and ends. Cylinder heads are being broached on the bottom.

Another application of revolutionary outlook has proved successful in the experimental stages. This is the broaching of the main bearings of automobile crankshafts—an application that opens a field hitherto thought to be beyond the sphere of broaching. In this application, broaching eliminates finish-turning and rough-grinding of the main bearings and, in some cases, both rough- and finish-grinding. Since a large number of cutting teeth are presented to the main bearings in the operation, the broaches will last for thousands of crankshafts between regrindings. The successful broaching of crankshafts should lead to the adoption of the same machining method for finishing the outside cylindrical surfaces of many other parts.

Hardened gears and other hardened parts can be broached successfully by employing a broach that has been heat-treated to meet requirements. Operations of this sort are practical, because broaches can be so designed that each successive tooth will remove an extremely small amount of stock.

Still another important advance in broaching practice is the cutting of spiral splines or spiral gear teeth in transmission gears to correspond with



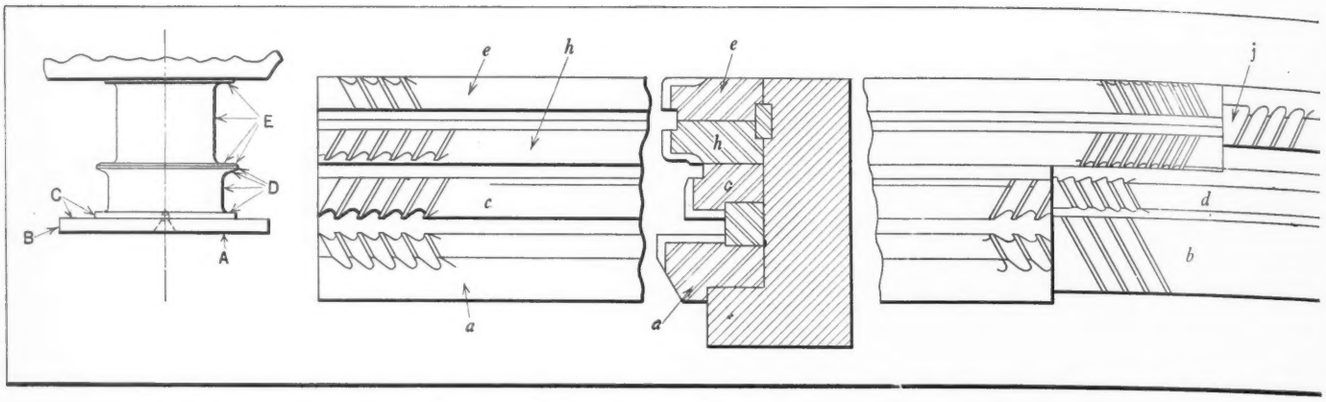


Fig. 1. The Broaching of Crankshaft Main Bearings Represents a Radical Departure in Broaching Practice.

the spiral of the transmission shaft or of the gear teeth, as the case may be. In such operations, the work revolves slowly as the broach moves through the part or the part remains stationary while the broach revolves and advances.

Hydraulic Machines Have Been a Big Factor in the Advancement of Broaching Practice

The recent advancements in broaching practice have been made possible to a large extent by the development of hydraulically operated broaching machines. Hydraulic power gives the smooth action necessary for a fine finish on the work, as well as the speed desirable for high rates of production.

The principal advantages of broaching are a high degree of finish, the machining of work to close tolerances, long tool life, low cost per piece, and high production. Simple work-holding fixtures usually suffice, and in many instances, fixtures are unnecessary. Vertical broaching machines are becoming increasingly popular because of the small floor space occupied.

In broaching the main bearings of automobile crankshafts, the work is revolved at a speed of about 40 revolutions per minute, and a composite broach is passed horizontally across the bearings at a feed of about 20 feet per minute. With the broach inverted, the chips fall down, clearing the work.

Fig. 1 illustrates the construction of the broach used for finishing various surfaces of the main bearing shown at the extreme left-hand end of the illustration. Not only the cylindrical surfaces of this bearing, but the oil sling and several other faces are broached simultaneously. Face *A* is finished by broach insert *a;* the two surfaces *C* by broach *c;* flange periphery *B* by broach *b;* and a chamfer at the front edge of surface *B* by broach *f.* First the straight cylindrical portion of surface *D* is finish-broached by insert *d* and then the two adjoining fillets are finished by broach insert *g.* The faces at each end of the main bearing *E* are roughed and finished by broaches *e* and *h,* which also rough out the bearing adjacent to the faces. The center of the main bearing is rough-broached by broach *j* and the bearing is finished for its entire width by broach *k.* The over-all length of the composite broach is 4 feet. In actual production, broach units consisting of broaches *e, h, j,* and *k* will broach the other [illegible] bearings simultaneously with the broaching of [illegible] main bearing illustrated.

On cylinder blocks an unusual degree of smooth-

Fig. 2. Broaching is Being Adopted for Finishing the Various Large Flat Surfaces of Automobile Cylinder Blocks

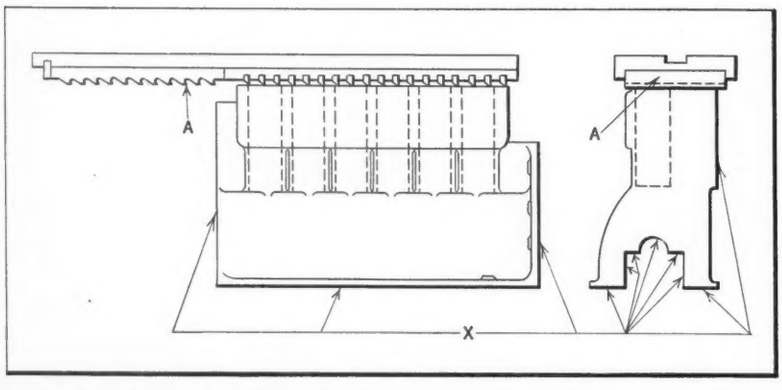
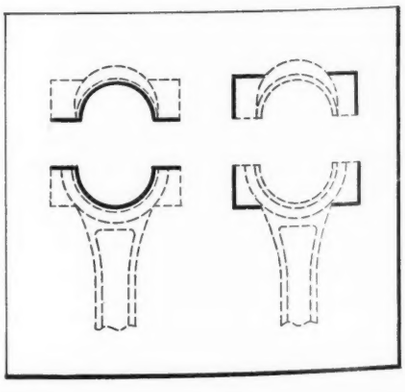
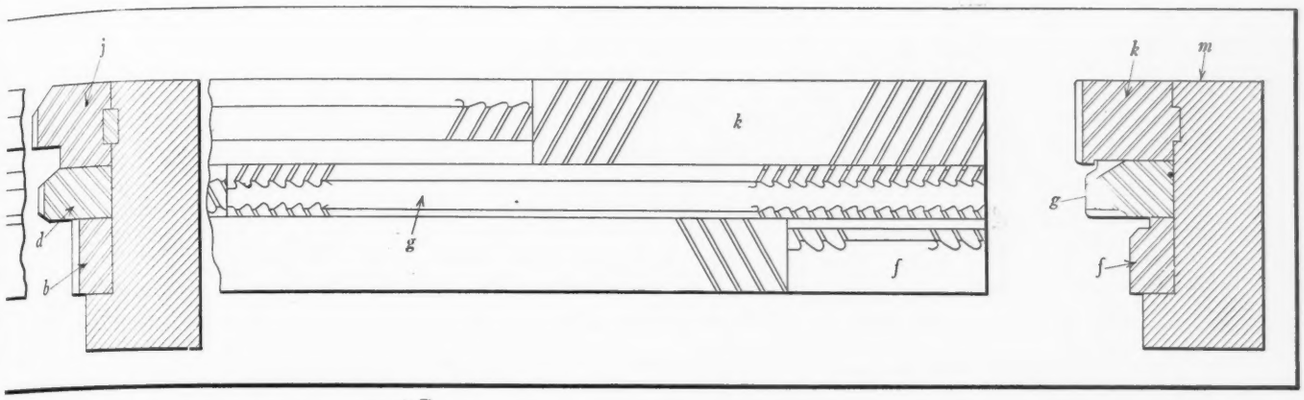


Fig. 3. Heavy Lines Show Surfaces Broached on Connecting-rods





A Composite Broach Such as the One Illustrated, is Fed Inverted Across the Revolving Main Bearing

ness and flatness is obtainable by broaching. The Ex-Cell-O Corporation has made broaches for finishing the top of cylinder blocks, as illustrated diagrammatically at *A* in Fig. 2. These broaches are designed to take both roughing and finishing cuts in one stroke. The production that can be expected on this operation is about 95 cylinder blocks an hour.

Other surfaces of cylinder blocks now being broached or that could readily be broached are indicated in Fig. 2 by the letter *X*.

Broaching Connecting-Rods and Their Caps

The surfaces of connecting-rods and their caps that are being finished by broaching are represented by heavy lines in Fig. 3. In the first operation on either a rod or cap, the semicircular bearing and the joint surfaces are broached. The broaching equipments for this operation on the rod and cap are identical, being designed as illustrated at the left in Fig. 4. It will be evident that the bore is machined by means of the round broach *A* and the two faces by the flat broaches *B* and *C*.

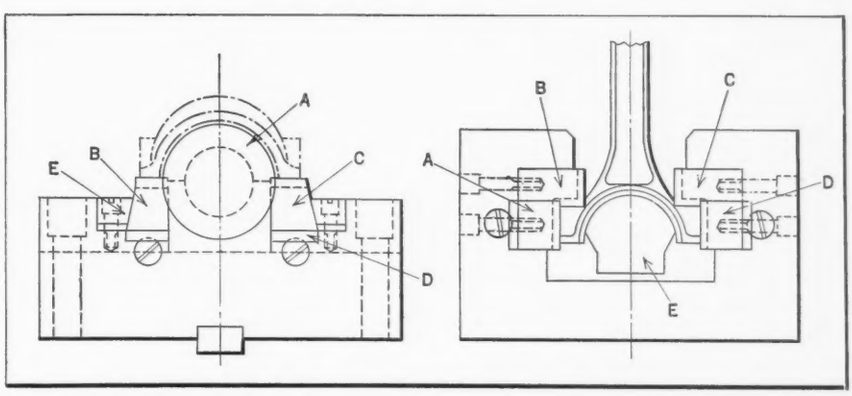
Full-width broaching of the joint surfaces is insured by interlocking the teeth of the flat broaches with those of the round broach. Both the flat broaches and the round broach are made in three sections. As the last or finishing section becomes worn in service, the other two sections can be moved forward, a new finishing section provided, and the entire broach reground. Another feature is that the round broach is provided with teeth around its entire circumference, so that as the teeth become dull on one-half the circumference, the broach can be turned 180 degrees and the other half of the tooth surfaces used. The flat broaches are backed up by adjusting shims, as indicated at *D*, and are locked by means of wedges *E*.

Four Broaches Are Used in Second Operation

In the second operation on the connecting-rod or on the cap, four broaches are employed simultaneously, as indicated at *A*, *B*, *C*, and *D* in the right-hand view of the same illustration. Broaches *B* and *C* cut across practically the full width of their bottom teeth and for a short distance on their front teeth. The bottom teeth of these broaches are interlocked with those of broaches *A* and *D* to insure machining all surfaces across their entire width. The connecting-rod or the cap is located accurately for this operation by seating the previously broached bearing surface on block *E*.

In actual practice, a double-ram broaching machine is set up for performing the two operations on the connecting-rod and another machine of the same type is arranged for the two operations on the cap. These parts are broached from the rough forgings. Each operation requires a pull of from 20,000 to 22,000 pounds, 7/32 inch of stock being removed all around the bores and about the same amount from the flat surfaces. The connecting-rods and caps are finished complete at the rate of

Fig. 4. Diagram Showing the Manner in which Broaches are Applied in Machining Connecting-rods and Their Caps



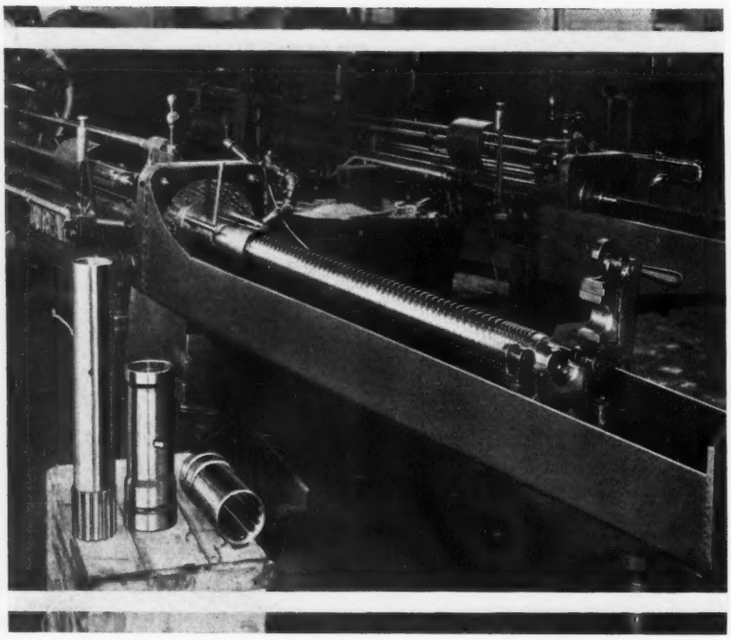


Fig. 5. Broaches 74 Inches Long and Weighing About 200 Pounds are Used to Broach Sixteen Splines in Airplane Shock Absorber Bodies. The Bodies of These Parts Have a Wall Thickness of Only 7/64 Inch—an Important Factor in Designing the Broach

about 220 pieces an hour. All the broach assemblies are approximately 4 feet long, their sections being 14 inches in length.

The Connecting-Rods are Size-Broached before Lapping

After the connecting-rods and their caps are assembled, a short sizing broach is used to insure that the bore will be held to the nominal size within a tolerance of 0.0003 inch. It must not be out of round more than 0.0002 inch.

In order to give a reasonably long life to the sizing broach used for this close operation, the broach is provided with replaceable finishing shells on the large end. Four or five shells can be used before a broach becomes under-size.

After being size-broached, the connecting-rod bores are lapped, from 0.0001 to 0.0002 inch of stock being removed.

Broaching Airplane Shock Absorber Parts

Sixteen splines are broached in each of the airplane shock absorber bodies seen on the box in Fig. 5. The length of surface broached varies from 3 to 15 inches. Being made of alloy steel, these bodies had to be designed as light as possible; hence the wall is only 7/64 inch thick for the greater part of its length, while the hole or bore is approximately 4 inches in diameter. This condition was an important factor in designing the broaches, because the high compressive force created in the operation had a tendency to cause the work to crumble.

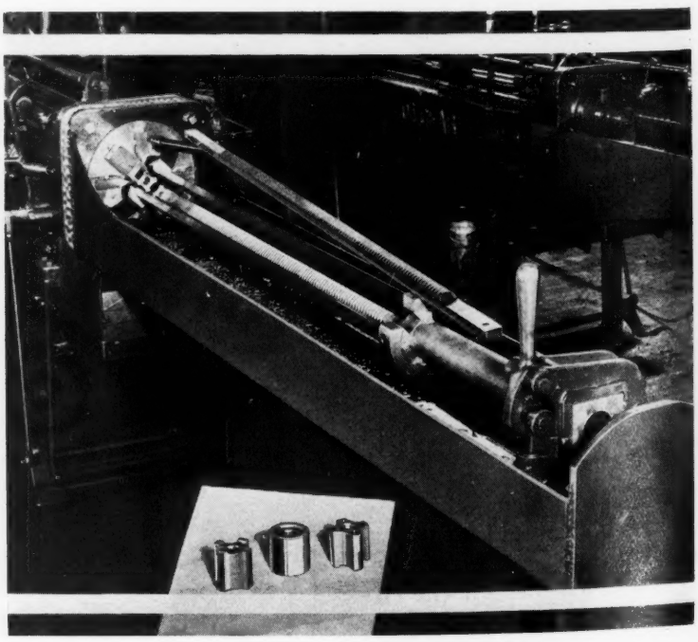
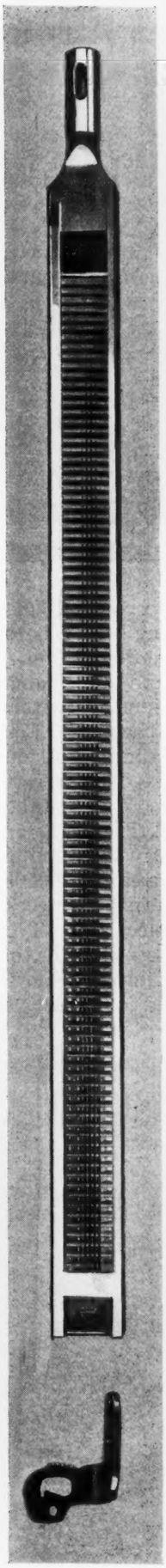


Fig. 6. Four Broaches Remove Equal Amounts of Stock to Form Circular Grooves in Rotor Hubs that Must be in Balance. One Broach can be Lifted out of the Operating Position for Reloading

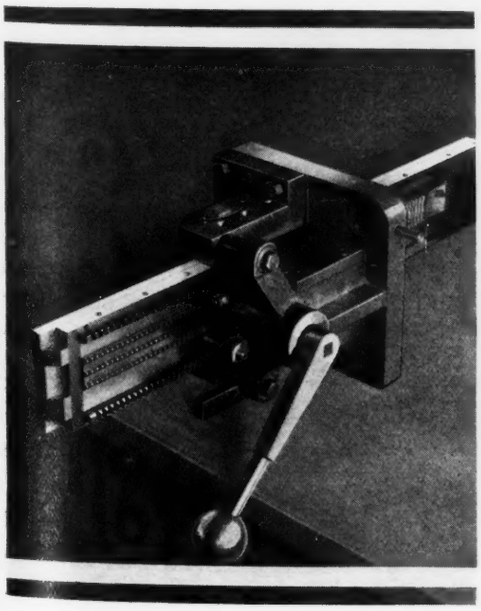
Fig. 7. An Insert Type of Broach that Cuts the Teeth on an Emergency Brake Lever



Two broaches are used on these parts, one a rougher and the other a finisher. The splines are about 0.17 inch deep, each broach removing approximately one-half of the stock. Both broaches are about 74 inches long over-all, and weigh 200 pounds. Because of their weight, a follow-up rest supports the rear end of the broaches during the operation. A small lug on the center shock absorber body provides a convenient means of lining these bodies up in the machine. The finishing broach is equipped with a replaceable sizing shell at the rear end. Approximately 5000 bodies can be broached with these tools before resharpening is necessary, and each broach can be reground from ten to fifteen times.

In the foreground of Fig. 6 are shown two rotor hubs and a blank similar to those from which they were produced. The four semicircular grooves on the outside of these hubs are produced by four broaches in the machine shown in the same illustration. The cylindrical blanks are approximately 2 1/4 inches in diameter and the grooves are cut to a depth of 7/16 inch. The tolerances specified for this part are not especially close, but it is important that the stock be removed equally to form the different grooves, because the part must be in balance. For this reason, the broaches are guided accurately as they pass over the work.

Fig. 8. Work Fixture which Gives High Rates of Production in Cutting Five Slots on Transmission Shifter Rods



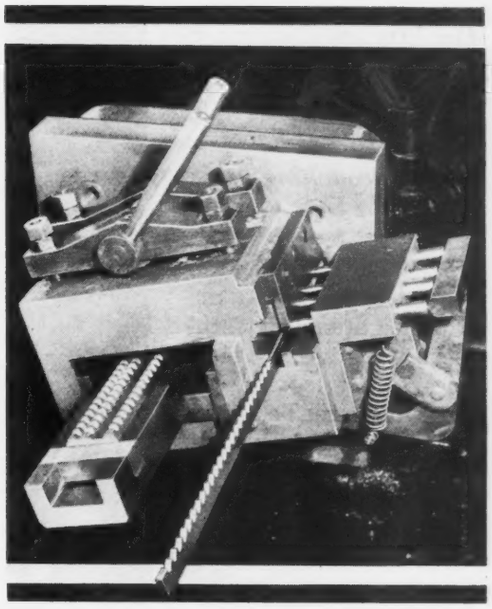


Fig. 9. Broaching Fixture Designed to Insure Washing Away of Chips and Ejection of the Work

One of the broaches is lifted from the broach-holder, as illustrated, for loading and removing the work pieces. The part is located for the operation by means of fingers spaced between the broaches. Clamping of the work is unnecessary, the operator merely slipping it between the fingers, locking the removable broach in place, and stepping on the pedal to start the operation. On the return stroke of the broaching ram, the finished work is carried to the right-hand end of the machine automatically, where it can be conveniently taken out when the removable broach is lifted. The production averages 60 pieces an hour. The broaches are 6 feet long over-all. It will be seen that the contour of the broaches gradually changes from a flat surface to a half-moon shape.

Irregular Contours are a Feature of Broaching Potentialities

A particular feature of broaching practice is the adaptability of this method to finishing irregular contours. In Fig. 7 (at the bottom) is shown an emergency hand-brake part with teeth produced by the

Fig. 10. Miniature Internal and External Gears, the Teeth of which are Produced by Broaching

broach above it. Four or five of these pieces are broached at one time, the operation taking place before the leg of the work has been bent to a right-angle as shown. This broach consists of an accurate holder, in which an insert with cutting teeth is assembled. This insert can be readily replaced when worn out without constructing an entirely new tool—a feature that represents a considerable saving in cost.

Broaches and a fixture designed for cutting five notches in a transmission-box shifter rod are illustrated in Fig. 8. The rod may be seen in the top row of parts in Fig. 11. This broaching equipment is also of the insert type, three broaches being mounted in one holder, so that any of them can be replaced at minimum expense when worn out. The holder is hardened and ground all over.

Four shifter rods are broached at one time. They are dropped into split bushings through a slot in the top of the fixture until the lower ends rest on a stop-bar. Then the rods are clamped by operating a cam-actuated lever. When the clamp is unlocked at the end of the broaching operation, the stop-bar swings forward, so that the pieces can fall into a chute. This broaching unit produces about 500 pieces an hour.

Equipment designed for a similar operation is shown in Fig. 9. In this case, the rods are slipped into the fixture from the left-hand end and clamped on top. When the clamp is opened at the end of the operation, four ejector pins on the right-hand side of the fixture force the pieces out. This fixture is inclined, so the cutting lubricant delivered through a pipe in the fixture can easily wash away all chips. Different sets of broaches can be used in the same fixture to suit a variety of shifter rods.

It must not be assumed from the foregoing that broaches need to be several inches in diameter or 4 to 6 feet long in order to be satisfactory. In the heading illustration, a man may be seen holding a broach only 1/16 inch square and 5 inches long. This little broach is used for finishing a hole in a fisherman's reel. Fig. 10 shows a small internal gear and the still smaller pinion which it engages. The pinion has seven involute teeth of 16 diametral pitch and the internal gear nine teeth. The outside diameter of the pinion is held within limits of 0.5127 and 0.5130 inch, while the outside diameter of the internal gear is held to 0.8750 inch within plus 0.0000 and minus 0.0003 inch.

Equally close tolerances were specified for the other dimensions. For instance, the accumulative error in the spacing of the teeth of either the pinion or the internal gear cannot exceed 0.0002 inch, and the error in concentricity between the pitch circle and the outside diameter of the teeth cannot exceed 0.0003 inch. Broaches 24 inches long machine five pieces at a time.

Typical parts that are being broached, in addition to those already referred to, are illustrated in Fig. 11. On the brass synchromesh cone gears seen near the left- and right-hand edges of the illustration, all splines are broached; on the steering arm near the bottom, the gear teeth are produced by broaching; and on the universal joint part seen in the center near the left-hand edge, the entire square opening is finished by broach-

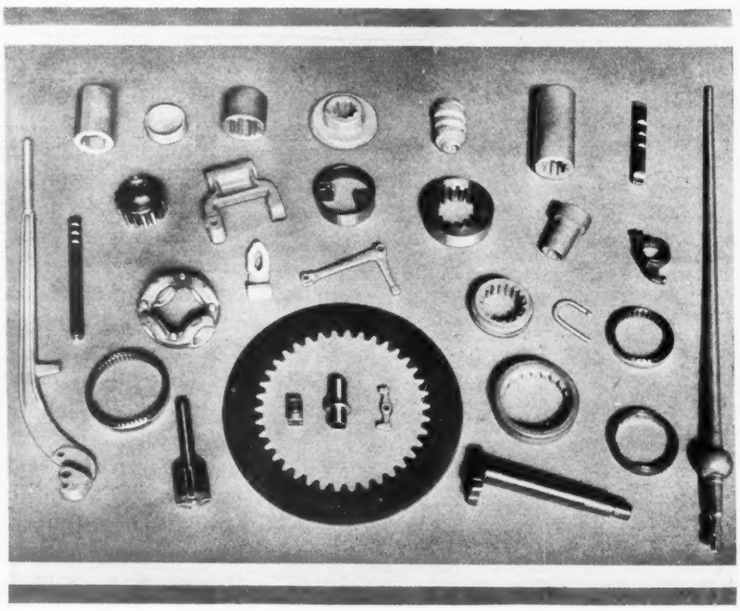


Fig. 11. Variety of Parts on which Certain Operations are Standard Broaching Practice

ing. Other parts are broached internally and externally. The large gear lamination is broached by an indexing method, because it would be impracticable to use a broach that would cut around such a large circumference at one time.

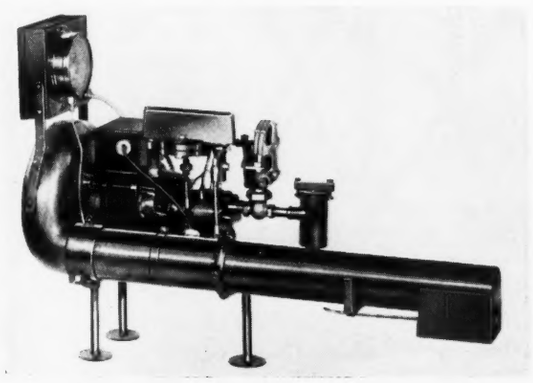
In selecting an oil for broaching operations, the user should be sure that the oil chosen possesses the necessary cooling and lubricating properties. By saving a few cents on oil, the life of broaches is often shortened, the desired finish is not obtained, and the cost per piece is increased. The Ex-Cell-O Corporation has found the following mixture to be suitable for the average soft steel job: 3 gallons of machine oil, 1 gallon of white lead, 1 1/2 gallons of paraffin oil, and 2 pounds of flour of sulphur. This mixture is also suitable for cast iron if 1 1/2 gallons of turpentine are added.

Regular soluble oil is suitable for many cast iron jobs and for brass. Kerosene is recommended by this concern for babbitt broaching operations. On unusually tough steel, when it is difficult to get a proper lubricant, the following mixture has given excellent results: 1 quart of turpentine, 2 pounds of white lead, and 2 pounds of flour of sulphur. After these ingredients have been mixed thoroughly, 1 gallon of linseed oil and 1 gallon of paraffin oil are added. This mixture should only be used on jobs of the class mentioned.

The Successful Operation of Any Cutting Tool Depends upon the Care Given it

Regardless of how accurately a broach has been designed and how carefully it has been made, it will produce the best results only when properly sharpened. Sharpening plays an important part in obtaining the maximum life of the broach, the best finish on the parts produced, and the highest rate of production. As with other cutting tools, successful operation depends upon the care given the tool.

The Evolution of an Automatic Oil Burner



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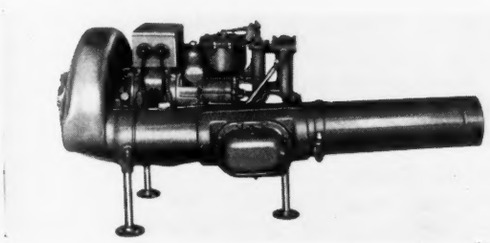

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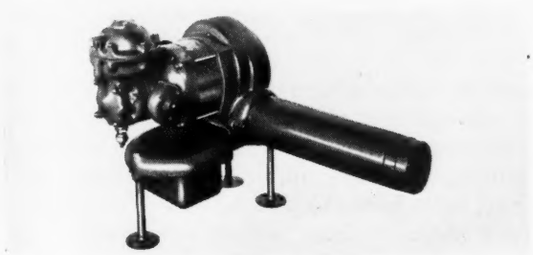


1933

The evolution of the design of the Oil-O-Matic burner was made possible, not only by new operating features, but also by the use of new and improved materials including alloy cast iron, stainless and other alloy steels, synthetic plastic materials, new bearing metals, and improved gasket materials. Improved machining methods have also made possible the economical use of these materials. Hence the oil burner designer, the materials manufacturer, and the machine tool builder have all contributed their share toward the successful development of a new product.

* * *

A Manual on the Presentation of Data

Many engineers find it necessary to collect a great amount of experimental data and to record test observations. How to present this data after it has been collected has been quite a problem. The American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa., has published a "Manual on Presentation of Data," which is available from the Society at 50 cents a copy. This manual covers the application of statistical methods to the problems of (1) condensing information contained in a set of observations, and (2) presenting the essential information in a concise form that is more easily interpreted than the original mass of data.

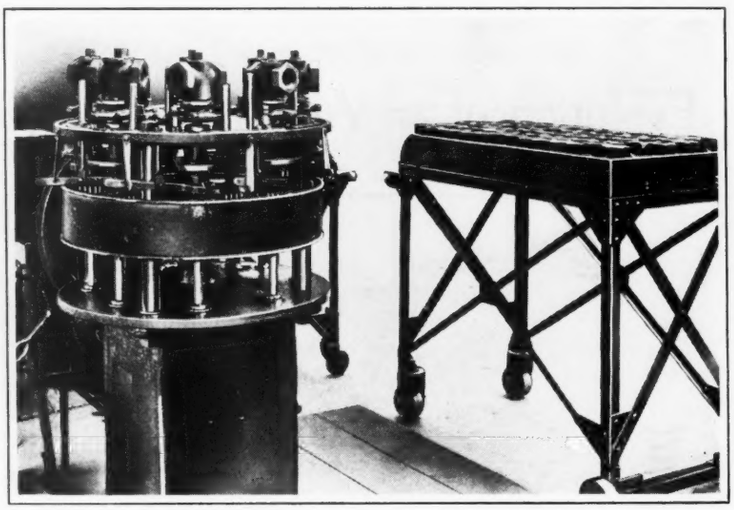
The manual should be of great value to engineers who are preparing either reports for their own organizations or papers to be presented before engineering societies. Frequently these papers fail to give an adequate idea of the conclusions that may be drawn from the observations.

Brake-Valve Grinding-In Machine

Eight brake valves are "ground in" simultaneously at the Stratford, Ontario, shops of the Canadian National Railways by means of the automatic machine here illustrated. The plug or spindle of each valve is attached to a spindle of the machine and Carborundum paste is smeared over it. Then a valve body is slipped loosely over each plug.

In the operation, the valve plugs revolve with the machine spindles at a speed of about 120 revolutions per minute, but the valve bodies are prevented from turning. Attached to each machine spindle there is a plate having two plugs which intermittently strike two studs attached to the collars on which the valve bodies rest. This causes the collars to jump up and down twice for each revolution of the spindles and produces quick vertical movements of the valve bodies on their plugs.

Any of the machine spindles can be disengaged individually from the driving mechanism for reloading. Power is transmitted to the spindles from a motor which drives a large spur gear in the center of the machine. Pinions mounted on the different spindles engage the teeth of this large gear.



Eight-spindle Valve Grinding-in Machine, and Truck Used for Small Parts in Preference to Tote Boxes

At the right of the grinding-in machine will be seen a high table-like truck. Trucks of this design are used throughout the shop in preference to tote boxes. With trucks this high, the work is always at waist height and the operator need not stoop so much as when the work is close to the floor in the ordinary tote boxes. C. O. H.

* * *

New Standard for Tapered Roller Bearings

The Bureau of Standards, Washington, D. C., announces that Simplified Practice Recommendation R67-33, on tapered roller bearings, became effective November 1. This recommendation was originally formulated in 1927. The present revision brings it into accord with the revised standard for tapered roller bearings adopted by the Society of Automotive Engineers, and also covers sizes up to a 12-inch bore, together with certain steep-angle bearings for naval use.

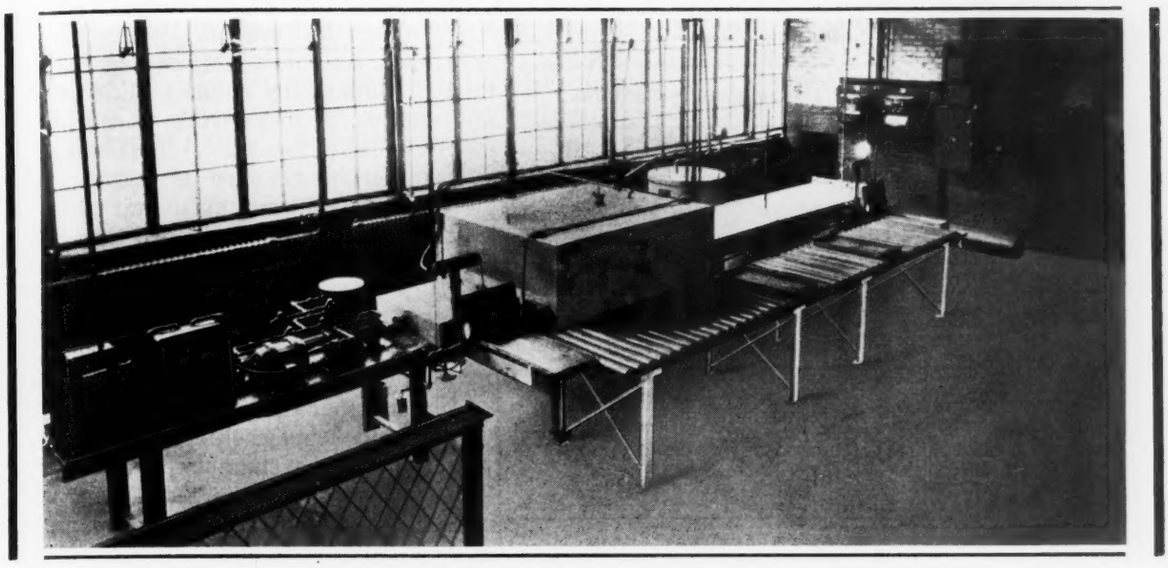
The "Running In" of Bearings

One feature that is recognized by the users and makers of journal bearings is that, up to a certain point at least, a bearing generally improves with use. When a new machine is first started up, the operator usually runs it at reduced speed and, if possible, under reduced load, and carefully watches to see that there is no excessive heating of the bearings. Then the load and speed are gradually increased until the machine is operating at its rated capacity. Even after this condition has been reached, it usually requires a rather long period of actual service before the machine becomes really "limbered up" and behaves in a normal manner.

One reason for this "limbering up" or "running in" process is that even with the best of technique in machining and finishing the working parts, the surfaces of the journals and the bearings are relatively rough as compared with the minimum thickness of the film of lubricant between them. Thus, even under rather light operating conditions, the high spots on the journals tend to strike those on the bearings, causing local breakdown of the oil film and corresponding increase in friction and heating. When these high spots come together, however, unless the surfaces are too rough or the load too great, a smoothing action will take place, either by the tearing off of particles on the high spots, or, if one of the surfaces is made of a relatively ductile metal, by a sort of cold-working. Under the proper conditions, this smoothing action continues until eventually the surfaces of the journals and bearings become relatively smooth and polished.—*S. A. McKee in Mechanical Engineering*

* * *

A new portable, alternating-current, testing set known as the "Industrial Analyzer," suitable for testing various electrical appliances and industrial apparatus and motors up to 100 horsepower, 440 volts, has been brought out by the Westinghouse Electric & Mfg. Co. This testing set is particularly useful to service men, plant maintenance men, and electrical dealers.



Annealing Steel Blanks in a Controlled Atmosphere Cuts Cost of Formed Parts

By M. W. BREWSTER
Industrial Heating Specialist
General Electric Co.
New Haven, Conn.

A COMPONENT part of a prominent Connecticut manufacturer's principal line of products is blanked and formed from 0.06 to 0.08 per cent carbon steel. Originally, this part was punched or blanked from cold-rolled steel strip purchased in the annealed condition and then subjected to a rather severe forming process. The blanking operation distinctly work-hardened the material, particularly on the edges. This resulted in the parts cracking during the forming operation and caused an excessive number of rejections. Those parts not rejected were unquestionably in a more highly strained condition than they would have been had the material been annealed after the blanking operation. It was obvious that the product into which the parts were assembled would be improved and rejections eliminated by annealing the material between the punching and forming operations.

Although elimination of rejections and improvement in quality were the two prime reasons for seeking a better manufacturing procedure, further analysis showed that savings from another factor alone would cover the cost of the annealing operation with the type of equipment finally installed. In this instance, a study of the various styles and sizes of punchings showed their average weight to be but 20 per cent of that of the steel strip from which they were made. The differential between purchased annealed and unannealed strip averaged 50 cents per 100 pounds, or 50 cents per 20 pounds in terms of the net weight of the formed parts. In other words, a saving of $10 per ton on purchased strip stock results in an allowable margin of $50 per ton for performing the annealing operation on the parts blanked from unannealed strip.

It was clear, therefore, that any equipment that could bright anneal the blanks for but a fraction of the $50 per ton margin would readily pay for itself on this basis alone, besides contributing toward the elimination of rejections and the improvement in the quality of the product. It was necessary that the annealing procedure adopted should produce blanks that were free from any deposit that would be detrimental to the forming dies. Further, it was essential that the parts also retain the characteristic lustrous appearance of cold-rolled steel strip.

Early in 1932, the controlled atmosphere furnace and auxiliaries shown in the heading illustration were purchased from the General Electric Co. for the purpose outlined. Test and cost data from this installation are given in Tables 1 and 2. From the savings indicated in Table 2, it is known that the equipment paid for itself in about one year. If it had run each day at the rated capacity of the furnace, namely, 300 pounds per hour, it would have paid for itself in approximately six months time. The cost analysis in Table 2 does not evaluate the additional savings from the elimination of rejections at the forming machines nor the increased

Table 1. Test Data on Annealing Furnace Economy at the Usual Production Rate

(Note: The usual production rate is about 180 to 200 lbs. per hr.)		
RUN	A*	B*
Net Production (Work Only)	980 lbs.	840 lbs.
Total Energy Used	195 KWH	135 KWH
Total Time of Run	5.3 hrs.	4 hrs.
Lbs. of work per hour	185	210
Lbs. of work per KWH	5.2	6.23

Notes:

1. Approx. Economy at rated capacity (300 lbs. per hr.) 7 lbs. per KWH
2. Gas consumption: 90 cu. ft. per hour*

*Test by the User.

reliability of the finished product, both of which are of appreciable value.

The type of furnace selected for a given job depends on many factors, and the actual and allowable annealing costs per ton are likely to vary with these factors. The "Total Operating Cost per Ton" (item D in Table 2) is not, of course, applicable to the annealing of mild steel in all types of electric furnaces.

The furnace equipment shown in the heading illustration is of the semi-automatic pusher tray type. It has sufficient capacity to anneal 300 pounds of punchings per hour at 1200 degrees F., and consists of the following essential parts: Charging chamber, heating chamber, water-jacketed cooling chamber, discharge chamber, pushing mechanism and control, twenty-five trays, tray return bench, automatic temperature control, and ammonia dissociator for producing the controlled atmosphere.

The trays—28 inches wide by 14 inches long—have light cast alloy frames and separate, perforated, flat sheet alloy bottoms. Each tray holds about 20 pounds of work loaded in stacks about 1 inch high. This method of loading permits a heavier charge per tray than a scattered loading. A scattered loading is also undesirable because of the increased possibility of warpage of the parts. Warpage is objectionable due to the fact that a number of the forming machines are fed automatically from magazines and it is necessary to have the parts quite flat when delivered to these machines. The trays were designed with this requirement in mind.

At both the charging and discharging doors, there is a pilot burner supplied with city gas. These can be noted in the heading illustration. When the foot-treadle for raising either door is operated, it automatically opens a slide valve that supplies gas to a curtain burner, which is ignited by the pilot. This gas curtain ignites the furnace atmosphere at the door and prevents excess air from entering the furnace. A loaded tray is placed on the loading shelf at the charging end of the furnace. After the door has been opened, the tray is pushed into the charging chamber and the door is closed.

The trays are pushed from the charging chamber through the furnace and the water-jacketed cooling chamber and into the discharge chamber by the hydraulic pusher mechanism. The pusher is operated by a motor-driven oil-pump. The motor is controlled by a magnetic reversing switch and a definite time relay which may be set to operate the pusher automatically on any predetermined cycle.

The charging chamber, furnace, cooling chamber, and discharge chamber combined, have a capacity of fifteen trays. Limit switches in both the charging and discharge chambers provide for making the pusher inoperative if there is a tray in the discharge chamber ready to be taken out or if there is no tray in the charging chamber to be pushed forward. If conditions at either end are incorrect for completing the cycle, this will be indicated by signal lights.

Table 2. Cost Analysis from Data in Table 1

(1) Electric Energy @ $0.015 per KWH
(2) Dissociated Ammonia @ $4.50 per 1000 cu.ft.* therefore 90 cu.ft. per hr.** x $\frac{4.50}{1000}$ = $0.405 per hr.
(3) Labor @ $0.60 per hr.
(4) Overhead @ 100% of labor charge
(5) 9 hrs. per day x 300 days per year = 2700 hrs. per year

A. Production Rates**	185 lbs/hr.	210 lbs/hr.	300 lbs/hr.
B. Data:			
1.) KWH per Ton = $\frac{2000 \text{ lbs.}}{\text{(lbs. per KWH)}}$ =	385	322	286
2.) No. of hours to anneal 1 Ton = $\frac{2000 \text{ lbs.}}{\text{(Production Rate)}}$ =	10.8	9.52	6.67
C. Costs in Dollars per Ton:			
1.) Electric Energy) = (KWH per ton) x $0.015 =	$5.77	$4.83	$4.29
2.) Dissociated Ammonia = (Hrs.per Ton) x $0.405 =	4.38	3.86	2.70
3.) Labor = (Hrs.per Ton) x $0.60 =	6.48	5.71	4.00
4.) Overhead = 100% of labor =	6.48	5.71	4.00
5.) Annealing Cost	$23.11	$20.11	$14.99
6.) Addition for contingencies and bringing furnace to temp. in morning = 10% of Annealing Cost	2.31	2.01	1.50
D. Total Operating Cost per Ton	$25.42	$22.12	$16.49
E. Tons annealed per year = $\frac{2700 \text{ hrs. per year}}{\text{(hrs. per ton)}}$ =	250	284	405
F. Margin per ton of punchings from purchasing unannealed strip*	$50.00	$50.00	$50.00
G. Savings per year = ($50.00-Operating Cost) x Tons per year	$6145.00	$7918.00	$13,572.00

* See Text
** Data from Table I

The relay is set for operation of the pusher at from four- to six-minute intervals, depending on production requirements. As soon as the pusher operates, the attendant inserts a tray in the charging chamber, so that it will be in position for the next operation of the pusher, and then removes the tray of cooled annealed work from the discharge chamber and empties it. During the remaining interval he is employed loading trays. The trays are returned to the charging end and can be loaded while on the roller conveyor tray return bench.

The pusher-tray type furnace selected jointly by the user and the manufacturer appeared to be the most practicable for the application at hand for the following reasons:

1. Since the charge and discharge ends are closed, except when a tray is being inserted or removed, this type of furnace requires a minimum volume of gas for the protective atmosphere.
2. In order to keep the variety of styles and sizes of parts sorted, it was advantageous to convey them through the furnace in trays.
3. One operator could readily take care of the loading and unloading of the tray-type furnace without interruption of the production flow, and in addition, have time for other duties in the vicinity of the furnace.
4. The use of an electric furnace would permit its installation near the forming machines so that, as the cooled work is removed from the discharge chamber in the furnace trays after being annealed, the parts would be available at the forming machines all stacked and ready for the forming magazines.

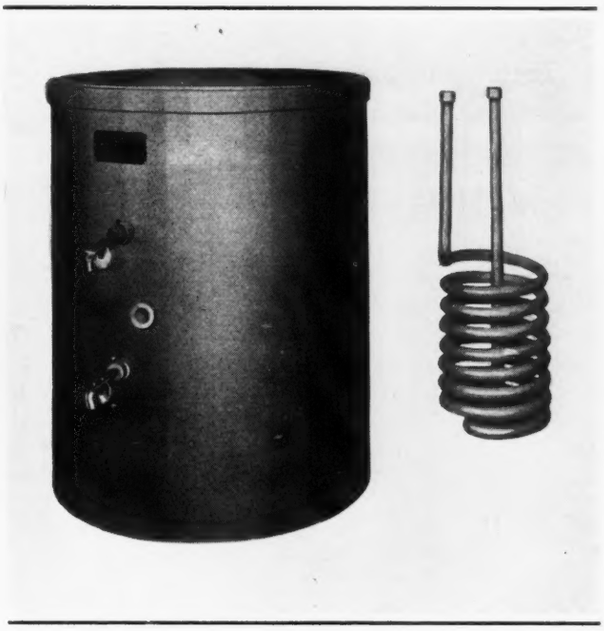


Fig. 1. Ammonia Dissociator and its Alloy Tube Dissociating Element before Insertion in the Dissociator Heating Chamber

How the Atmosphere of the Furnace is Controlled

An ammonia dissociator supplies gas for the controlled atmosphere to prevent oxidation of the work during the heating and cooling periods. Tanked anhydrous ammonia purchased in 100-pound cylinders is piped to the dissociator. The tanks are laid on the platform scale beside the dissociator, so that the contents can be conveniently checked at any time. Two cylinders are piped together with suitable valves in the supply line, so that as the contents of one cylinder are depleted, no time is lost in switching to the other.

The ammonia from the cylinder is piped through a reducing valve and regulator which indicate on one dial the tank pressure on the incoming line, and which have a regulating valve and a dial for reading and adjusting the outgoing pressure to the dissociator. This dissociator is shown in Fig. 1. It is essentially a vertical, cylindrical furnace, inside of which there is a spirally coiled alloy tube. Ammonia enters one end of the coil and, in the presence of the catalyst and heat, breaks down the ammonia, NH_3, into its components, the resulting product being a gas mixture containing 25 per cent nitrogen and 75 per cent hydrogen. A 100-pound cylinder of ammonia produces approximately 4500 cubic feet of gas at a cost of $4 to $5 per 1000 cubic feet.

* * *

Forestalling Labor Troubles

A booklet entitled "Forestalling Labor Troubles," written by Allen W. Rucker in collaboration with N. W. Pickering, president of the Farrel-Birmingham Co., Inc., Ansonia, Conn., has been published by that company. It is pointed out that a study of economic history shows that labor disputes increase in periods of rising prices and that those industries suffer least in which there have been the greatest developments in machine efficiency and the highest productivity per worker. These facts are brought out in the booklet in a manner that leads to the conclusion that industry has within its own power a means of averting the economic losses attendant upon labor troubles. When individual productivity and earning capacity is increased and arduous labor reduced through the installation of improved machinery, industrial peace is generally insured.

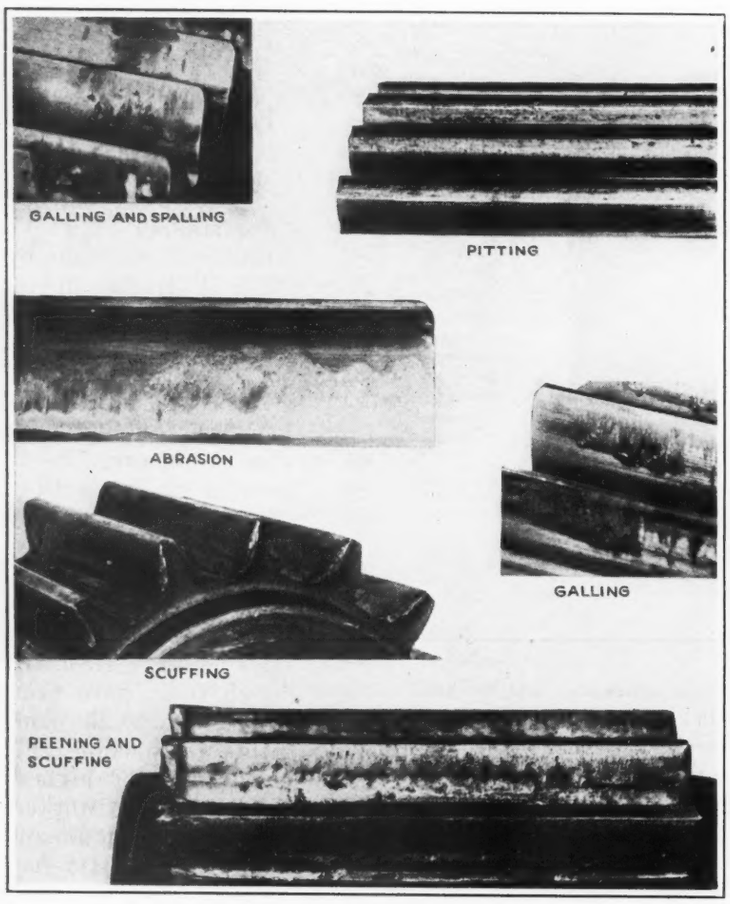
* * *

We have made a great fetish of saving pennies in direct-production costs, but have been content meanwhile to waste dollars lavishly in distribution costs. The mechanisms of mass production have the excellence and finesse of the up-to-the-minute twelve-cylinder motor car, but the designs and functionings of distribution schemes remind one of a 1914-model farm tractor.—*James D. Mooney, Vice-president, General Motors Corporation*

Selecting Steels for Industrial Gearing

Why Certain Steels with Properties Apparently Less Desirable than Others Sometimes Make the Best Wearing Gears

By T. R. RIDEOUT, Nuttall Works
Westinghouse Electric & Mfg. Co.



Examples of Gear Tooth Wear

THE term "industrial gearing" covers a great variety of gear applications. The widely varying types of duty that must be performed by these gears make necessary the use of steels having different characteristics. The suitability of a steel for any given application is governed by its ability to perform its duty satisfactorily, that is, without failure through breakage or undue wear. As a general rule, the strength of a gear is taken care of in the design. A steel is selected having characteristics suitable for the nature of the service, and the dimensions of the gears are made sufficiently large to preclude failure by breakage.

Seldom, if ever, do properly designed gears fail through breakage of the teeth. When such breakage does occur, it is generally caused by something other than the lack of suitable physical properties. The majority of failures are due to some form of failure of the surfaces of the teeth that carry the loads. Such failures are generally due to wear and may result from any one of the following causes: Pitting, spalling, galling, peening, scuffing, or abrasion. (See the accompanying illustration.)

The ability of a steel to withstand tooth breakage is governed by its strength and toughness, the degree necessary being dictated by the nature of the loads. For any given steel, the strength is proportional to the hardness, which, in turn, is a function of the carbon content, the alloying elements, and the heat-treatment. Toughness is defined as the ability to withstand shock or impact loads without fracture or undue deformation, and is measured by the relation of the yield point to the ultimate strength, reduction of area, and elongation.

Toughness Necessary for Shock-Resistant Gears

While great strength is desirable, accompanying brittleness or lack of ductility is detrimental. Therefore, if shock loads are involved, a steel of the maximum possible toughness commensurate with the necessary strength should be used.

The hardness penetration from surface to core is an important factor which is often neglected. The hardness drop is an indication of the toughness, but the actual strength of the teeth is not that indicated by the hardness of the steel at the surface. The strength of the teeth should be calculated from the strength of the steel at the base of the tooth, where the stress is the greatest. Table 1 gives the hardness at different depths from the surface for the same gear made of three different materials, treated to the correct hardness. The physical properties at both the surface and the root of the teeth are given

in the lower part of the table. A study of the table makes it obvious that the strength of the teeth, according to the Lewis formula, should be calculated from the physical properties at the root of the tooth. In each case, the strength at the root is much less than at the surface of the gear, but the toughness as indicated by the reduction of area and elongation is much greater.

Strength at Root of Tooth Differs from that of Test Bar

Great care must be employed in using the conventional physical property values in calculations for the strength of gear teeth. Such values are usually obtained from a 1-inch test bar and may be entirely different from those of a gear tooth, even though made from the same material and given the same heat-treatment. The pitch of the teeth and the size and shape of the gear affect those values appreciably.

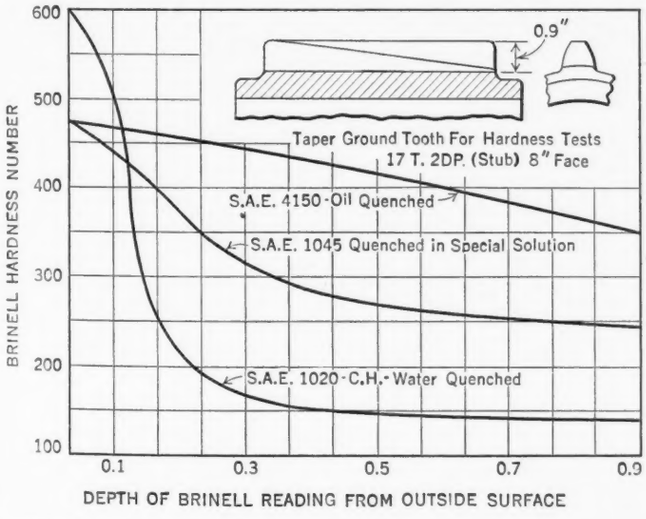
In attempting to select a steel that will give satisfactory service and length of life, we are somewhat at a loss for a suitable criterion. In other words, what particular quality or combination of qualities makes a good gear steel? The author has seen cases where steels of apparently suitable characteristics failed through undue wear, and yet other steels, having the same and sometimes apparently less desirable physical properties, were successful when substituted for the original steels. In some instances, no reasons for the failures were apparent, which leads to the belief that everything is not yet known regarding the answer to the problem of what makes a good gear steel. Nevertheless, proper consideration of some of the known factors governing gear operation will lead to better results in all cases.

Lacking more complete information regarding the wearing qualities of steels, the hardness, grain size, and structure must be used as criteria. Experience has shown that some kinds of alloy steels have better wearing qualities than others, but complete data are lacking. In general, it may be said that the harder the surface, the finer the grain size, and the more regular the structure, the more wear-resisting the steel will be.

Table 2. Casehardening Steels for Gears

Kind of Steel	Characteristics and Uses
SAE 1020	For parts that must be wear-resisting. The core is very ductile. No great core strength.
SAE 2315	For parts where a tough core and a hard case are necessary for strength and wear resistance. Distortion is low. A good all around casehardening steel.
SAE 3115	Particularly suited for selective casehardening where the non-casehardened parts must be strong. Also suitable for large parts. An extremely strong and tough steel.
SAE 2512	For parts where extreme strength, toughness, and resistance to wear are desired. Distortion after quenching much less than for any of the previous steels.

Table 1. Comparative Hardness and Physical Properties of Steels Used for Gears. Hardness Readings Taken at Different Depths



	SAE 1020		SAE 1045		SAE 4150	
	Surface	Root	Surface	Root	Surface	Root
Ultimate Strength	295,000	93,000	234,000	145,000	250,000	170,000
Yield Point	274,000	66,000	211,000	99,000	220,000	156,000
Reduction of Area, Per Cent	.....	50	.....	44	35	60
Elongation in 2 Inches, Per Cent	.....	16	.....	17	8	16
Hardness, Brinell	600	140	477	245	477	350

Making Pinion Harder than Gear Equalizes Wear

Beneficial results from a wear standpoint are obtained by making the pinion harder than the gear. The pinion, having a lesser number of teeth than the gear, naturally does more work per tooth, and the differential in hardness between the pinion and the gear (the amount being dependent on the ratio) serves to equalize the rate of wear. The harder pinion teeth correct the errors in the gear teeth to some extent by the initial wear and then seem to burnish the teeth of the gear and increase its ability to withstand wear by the greater hardness due to the cold-working of the surface.

In applications where the gear ratio is high and there are no severe shock loads, a casehardened pinion running with an oil-treated gear, treated to a Brinell hardness at which the teeth may be cut after treating, is an excellent combination. The pinion, being relatively small, is distorted

but little, and distortion in the gear is circumvented by cutting the teeth after treatment.

When Plain Carbon and Alloy Steels are Used

Gear steels may be divided into two kinds—plain carbon and alloy steels. Alloy steels are beginning to be used to a considerable extent in the industrial field, but carbon steels are, and probably always will be, the principal industrial gear steels, particularly for the larger sizes. There are two reasons for that. First, as a general rule, size and weight are not serious factors, and industrial gears can be designed large enough to have the requisite strength when made of carbon steel. Second, alloy steels cost more, and it is sometimes difficult to obtain alloy steel castings, particularly when the quantity required is not great.

Heat-treated forged carbon-steel pinions running with untreated cast-steel gears is the most generally used combination for the larger gear drives, but if there are limitations as to the size or if strength requirements dictate, the pinion may be made of treated alloy steel and the gear treated. The gear teeth, due to the greater thickness at the base of the tooth, are always stronger than the pinion teeth, and as the gear has a larger number of teeth than the pinion, it receives less wear. Therefore, the use of alloy steel for gears is seldom justified. Each of the two general kinds of steels, plain carbon and alloy, may be further subdivided into four types as follows:

1. Casehardening steels.

Table 3. Full-Hardening Steels for Gears

Kind of Steel	Characteristics, Treatment, and Uses
SAE 1045 (Forgings) SAE 1240 (Castings)	Quench in brine or circulating water to obtain desired hardness. For medium and large sized parts where strength, toughness, and resistance to wear are desired. An excellent "tough hard" material for parts subjected to shock. Cannot be used for parts having thin sections.
SAE 1045 (Forgings) SAE 1240 (Castings)	Oil-quench. For parts where toughness, medium hardness, and minimum distortion are required. Especially suitable for shafts and large gears.
SAE 3145	Oil-quench. A strong, tough steel with great capacity for resisting shock loads. A good all around, inexpensive alloy steel.
SAE 6145	Oil-quench. For gears where hardness combined with strength and toughness is required. Somewhat difficult to machine. A sensitive heat-treating steel.
SAE 4150	Oil-quench. Toughness and shock resistance with no sacrifice in hardness are obtainable with this steel. Hardness penetration is deep and distortion low.

Table 4. Steels for Gears Machined After Heat-Treatment

Kind of Steel	Characteristics and Treatment
SAE 1045 (Forgings) SAE 1240 (Castings)	Water-quench and draw. Strength, toughness, and wear resistance are good. Ductile, and therefore highly resistant to shock.
SAE 3140	Oil-treat and draw. Greater strength and toughness obtainable than with SAE 1045. A good all around steel. Very resistant to fatigue failures.
SAE 5130	Oil- or water-quench and draw. Strength and toughness values are high. Easily machineable. Very resistant to wear. Impact strength is great.
SAE 4130	Oil- or water-quench and draw. At the same hardness, the toughness and ductility are greater than for the previous steels. Easily machineable at high hardnesses. Great impact strength.

2. Full-hardening steels.
3. Steels that are heat-treated and drawn to a hardness that will permit machining.
4. Steels that are not hardened or treated.

The first two types—casehardening and full-hardening—are interchangeable for some kinds of service, and the selection is often a matter of personal choice.

Applications of Casehardening Steels

Casehardening steels are used when a hard wearing surface is desired. The carburizing process raises the carbon content of the surface of the low-carbon casehardening steels to a degree approaching that of the tool steels. When quenched, the high carbon content surface, or case, as it is called, has an extremely fine grain and high hardness—an excellent combination for resisting wear.

The core of the plain carbon casehardening steels is soft and ductile, but the strength is not great. The casehardening alloy steels have a strong and tough core, the degree being dependent upon the alloying elements. With either the plain carbon or alloy steels the core strength and toughness can be improved by the use of a double quench, although not to the same degree as is true of the full-hardening steels.

Although the core of the casehardening steels is soft and ductile, and therefore shock-resisting, the case is extremely hard and brittle. If the hardness were evenly graduated from surface to core, a very tough and shock-resisting material would result, but the change from the hard case to the soft core takes place in a very narrow zone. For that reason, casehardening steels, particularly the plain carbon steels, are not to be recommended for impact or severe shock loads; for while the core will yield, there is danger of the case cracking or spalling.

Use of Full-Hardening Steels

Full-hardening steels are used when great strength, toughness, and resistance to shock are required. The degree is governed by the kind of steel and by the treatment. Fairly high surface hardnesses are obtainable in this group, although not so high as in the casehardening group. For that reason, the resistance to wear is not so great as might be obtained, but when wear resistance, combined with great strength and toughness, is desired, this type of steel is superior.

Full-hardening steels, like any other steel requiring a drastic quench to obtain the desired physical properties, become distorted to some extent when hardened. Therefore, the use of full-hardening steels is not suitable for high-speed gearing, where noise is a factor, or for gearing where accuracy is of paramount importance, unless, of course, grinding of the teeth is practicable.

Use of Steels that Can be Hardened and Drawn before Cutting the Teeth

The third type of steels is that used when the expense of grinding the teeth is not justified or practicable and the service requirements are such that the degree of accuracy required eliminates the casehardening or full-hardening steels with their unfortunate but unpreventable tendency to become distorted when quenched.

Steels of this type are generally referred to as heat-treating steels to distinguish them from the full-hardening type. Distortion is prevented by cutting the teeth after the blank is heat-treated. The machining is made possible by drawing the steel at a high drawing temperature to within the range of machineable hardness, after the initial quench.

As the physical properties and wearing qualities are proportional to the hardness, steels of this type obviously cannot be quite so strong or wear-resisting as the other two types. Owing to the high percentage values of reduction of area and elongation, they are extremely tough and shock-resisting, and the lack of strength is somewhat compensated for by the elimination of the increment loads due to inaccuracies. The teeth of gears of larger pitch are rough-cut before heat-treatment and finish-cut afterward to insure the desired physical properties throughout the teeth.

Application of Steels that Receive No Heat-Treatment

For most industrial applications, heat-treating of one or both members of a gear train is necessary and desirable for satisfactory service. However, there are some applications where the loads are not severe or the gears are only in operation occasionally. For those applications, unhardened medium- or low-carbon steels are suitable and economical.

There is a class of steels in which toughness and strength are obtained by means of suitable combinations of alloying elements or by very high percentages of carbon content, and that do not require hardening, but as they are entirely special and seldom used for ordinary gear applications, they will not be discussed in this article.

Careful consideration of the factors previously discussed, combined with experience with many different steels, has made possible the selection of a restricted list of steels which seem to fulfill adequately the general requirements of industrial gearing. The steels are listed in Tables 2, 3, and 4, being grouped according to their qualifications which, in general, are as follows:

1. The most generally used and economical steel of that type.
2. A good general-purpose steel.
3. Steels that may be selected to give the best results for one or more of the following requisites: (a) Strength; (b) toughness; and (c) wear resistance.
4. The steel that seems to combine the highest values of the greatest number of requisites for that type of gear steel.

It would be impossible to cover fully the individual characteristics of each steel listed, but salient characteristics and general comments have been given wherever deemed important. The most popular of each kind of steel has been given, but the carbon content and the quench, whether single or double, brine or water, may be varied if desirable.

* * *

Trained Engineers and Shop Executives Available

The Engineering Societies' Employment Service, 29 W. 39th St., New York City, is in a position to recommend to manufacturers in the industrial field, engineers and shop executives with long training in almost every branch of industry. Whenever technically trained men, shop supervisors, designers, or engineering salesmen are required, it would prove advantageous to manufacturers to communicate with this employment service, which renders assistance free of charge to the manufacturer.

Records are kept of hundreds of engineers, giving complete details as to age, education, and previous experience, names of former employers, etc. This information is forwarded to the manufacturer looking for men; the records of a sufficient number of suitable men are sent, so that the manufacturer can pick out those that seem to him to best meet his requirements. He can then enter into personal correspondence with, or interview, those who seem most likely to meet his needs.

During the present period, when industry shows definite signs of recovery, many manufacturers will find it necessary to engage men for new activities. It is in order to serve industry, as well as engineers who are out of employment, that this service is being maintained.

Notes and Comment on Engineering Topics

About five linear feet of bronze-welding was recently carried out in the repair of a logging railway locomotive cylinder block which had cracked badly. The management estimated that this job, which took but a day's time, saved them more than $400. —*Oxy-Acetylene Tips*

A new cable insulated with Glyptal-treated cloth, which is capable of resisting oil and withstanding high temperatures, has been developed by the General Electric Co. In addition to its ability to resist oil and heat, this new cable is characterized by unusual flexibility and toughness, which enables it to withstand severe mechanical strain. The insulating material known as Glyptal is a synthetic resin, produced from phthalic anhydride and glycerine, which is unaffected by mineral oil. Because of this inherent quality, Glyptal-treated cloth has a distinct advantage over varnish-treated cloths as an insulating material. The new cloth also maintains its original properties over long periods of time, even at high temperatures.

An electric-current meter which keeps a continuous record of infinitesimal electrical currents and is said to be the most sensitive meter of its kind ever developed was recently described by H. L. Bernarde and L. J. Lunas, engineers of the Westinghouse Electric & Mfg. Co. This new meter records with great accuracy direct currents of four or five micro-watts, equivalent to approximately 1/10,000,000 part of the energy required in an ordinary 40- or 50-watt light bulb used in the home. It is stated that it records alternating current of lower value than any similar apparatus.

A steam generator of revolutionary design is now being manufactured at the works of Richardsons, Westgarth & Co., of West Hartlepool, England. This equipment is the result of years of research and experimenting by Brown, Boveri & Co., the Swiss engineering firm, working in cooperation with the Richardsons company.

The new steam generator is known by the trade name "Velox." It is said to occupy only one-eighth the space and to have only one-quarter the weight of an ordinary water-tube boiler evaporating an equal amount of steam. Starting from cold, full steam pressure can be obtained in about six minutes and full output in eight minutes. The steam generator is based on the principle of burning liquid or gaseous fuel under pressure, in order to obtain high flue gas velocity. The fuel burns at a pressure of 20 pounds per square inch above that of the atmosphere.

A wire rope, claimed by its manufacturers to be one of the largest ever made, has been produced by the Whitecross Co., Warrington, England. This rope is 2 1/2 inches in diameter, or approximately 8 inches in circumference, and is 3300 feet long. It is used for colliery service.

Heating the soil by electricity in order to grow fruit and vegetables in the open at all times of the year is being experimented with by the Newcastle and District Electric Lighting Co. in England. It has been shown that with this arrangement, tomatoes can be grown in the open air in the north of England, something that the climatic conditions there ordinarily do not permit.

A most remarkable example of small oil consumption for the bearings of a 30-horsepower, direct-current Westinghouse motor, operating at 1750 revolutions per minute, has been recorded by that company. The motor was installed in June, 1929. The oil feeder is an inverted glass jar holding about four ounces of oil when full. During three years' service, no oil was added to the bearing or the oil feeder; and at the end of the three years, three-fourths of the oil still remained in the glass jar. In other words, the motor used less than one ounce of oil in three years' service, running eight hours a day every working day since its installation. After three years' service, it ran as well as ever.

In a paper by O. D. Treiber, of the Hercules Motors Corporation, read before the Automotive Engineering Congress in Chicago, the author mentions that the original Diesel engine and practically all subsequent developments up to recent years were

of the slow-speed, heavily constructed type, the engines being generally of large size. Ten years ago, bores of 8 inches were considered small, and a speed of 325 revolutions per minute was considered fast; hence the Diesel engine was not considered for automotive purposes at that time. Of late, however, several Diesel engines have been made for such purposes, more especially for trucks. These engines now run up to 2000 revolutions per minute with cylinder bores as small as 4 1/2 inches in diameter.

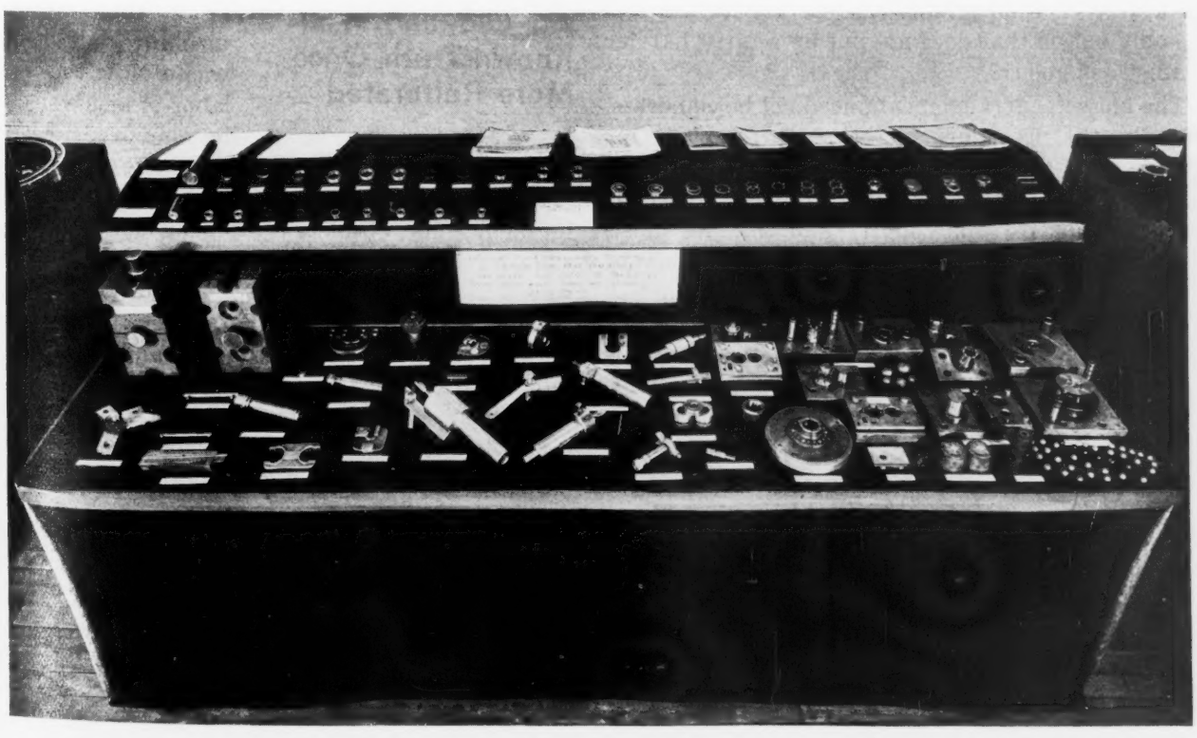
What is reported to be the largest newsprint paper-making machine in the world is being built by Charles Walmsley, Ltd., of Bury, Lancashire, England. This machine will produce from 200 to 225 tons of paper a day, and is said to be designed to run at a speed of 1400 feet a minute.

The Soviet Government is developing several power-plant undertakings in the extreme north, some north of the Arctic Circle. One of these is located between Lake Imandra and the White Sea, where 150,000 kilowatts will be developed if the total contemplated output of the three stations planned is ultimately produced. One station of 60,000 kilowatts is near completion. The stations utilize the 425-foot fall of water from Lake Imandra to the sea. The power is to be employed in mining extensive deposits of apatite, and in metallurgical operations.

For the driving of centrifugal pumps, fans, and other relatively low-speed apparatus by means of a speed-reducing gear, the General Electric Co., Schenectady, N. Y., has designed a new line of close-coupled turbine-gear sets, each consisting of a steam turbine and speed-reducing gear. These sets are particularly applicable where exhaust steam can be used for heating purposes. The capacity of this new line of turbine-gear sets ranges from 10 to 150 horsepower.

The London, Midland and Scottish Railway has decided to make extensive trials with light self-propelled motor rail cars with a view to substituting them for the heavier steam trains on lines where passenger traffic is light, for the purpose of increasing the frequency of service. The cars ordered up to the present time are in various sizes, with seating capacities of from forty to seventy.

The Evolution of a Ball Bearing. On the Upper Shelf in the Illustration is Shown the Sequence of Thirty-four Operations Required in Making One Size of One Type of Fafnir Ball Bearing, from the Forging of the Race to the Packaging. On the Lower Shelf is Illustrated a Partial Display of the Tools and Dies Required for the Manufacture of One Size of Bearing. Some Idea of the Total Number of Tools and Dies Used in Ball Bearing Manufacture can be Gained from the Fact that the Fafnir Bearing Co. Makes 14,000 Sizes and Types of Bearings.



EDITORIAL COMMENT

How Can Russian Machine Purchases Be Financed?

For years the opportunities for trade with the Soviet Republic have been only partially utilized. Now that the Soviet Government has been recognized by the United States, active business with Russia can be resumed to great advantage to the machinery industries.

The first question that arises is: How are the machinery purchases of the Soviet Government to be financed? Should our Government make a loan to the Soviets? Should the Government guarantee payments to our manufacturers?

It does not seem necessary for our Government to lend money to the Soviet Republic. Our experience in lending money to foreign governments has not been highly satisfactory, and there will be a great deal of opposition to new foreign loans; but this should not stand in the way of adequately financing our trade with Russia. It should be financed in the same manner as all successful foreign trade is financed—by importing the materials that this country must get from abroad because they are not obtainable here. We are now importing from abroad many materials that could be supplied by Russia. Why not let Russia supply these materials, especially since the Soviet Republic is the only nation that does not put up a tariff barrier against our goods?

The financial arrangements need not be elaborate. Broadly, the procedure might be as follows: Our Government and the Soviet Republic would estimate the annual value of materials that Russia is able to export to this country and that we must, by necessity, import from abroad—materials of which we do not have sufficient supplies within our own borders. Facilities would be provided for the Soviet Government to export such materials to the United States on the same terms as other nations.

The payment for these imports would be placed in trust with selected banking institutions, to be applied only to the payment for goods and materials bought by the Soviet Republic in this country. Since manufacturers here would obviously have to grant easy terms of payment, our Government would guarantee the payment of orders placed; but the Government guarantee should not exceed, as a total, the estimated value of the annual imports from the Soviet Republic. In this way, there should be no risk attached to the Government guarantee; and individual manufacturers would be safeguarded in their transactions. It is obvious that the Government would have to place its stamp of approval on orders placed under the Government guarantee, to prevent orders being placed in excess of the annual estimated quota.

Such a plan, in all probability, would make it possible to establish a large volume of trade with the Soviet Republic without involving our Government in additional obligations, and at the same time would safeguard individual manufacturers in their transactions. It would make it possible for the Soviet Government to pay promptly when their obligations became due. It would give industry in this country an opportunity to recapture the Russian business and develop it still further. For many years to come, Russia will offer a great market for American machinery and manufactured products, and any reasonable plan for obtaining this business should be carefully considered.

An Old and Well-Known Truth Once More Reiterated

Any machine tool over ten years old should be considered obsolete unless it has been proved, by careful comparisons, that it can still be efficiently employed. Old, obsolete, and inefficient machine equipment is wasteful. It wastes the labor of men who could be employed to better advantage, earning bigger wages for themselves and better returns for their employer. Because of its inefficiency, obsolete equipment makes it impossible for the employer to earn enough to pay such wages as our industrial development should make feasible. It turns profits into losses, employment into unemployment, and a high standard of living into a bare subsistence wage.

It was because of efficient machinery that the people in the United States were able to raise their standard of living to a higher level than exists anywhere else in the world; and it is only through the continued use of efficient machinery that it will be possible to maintain the standard of living at this high level. Employment and prosperity are not promoted by reducing the products of industry, but by distributing equitably the products that machines help to create.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Solenoid-Operated Reversible Ratchet Mechanism

By W. E. JENNINGS

The mechanism shown in Fig. 1 has interesting possibilities as a means for controlling machines or equipment from a distance. By sending current through one of the two electromagnets or solenoids *L* and *R* one of the two centering springs *P* will be stretched so that it will index the ratchet wheel one tooth in one direction when the current to the solenoid is cut off. Sending electric current through the other solenoid indexes the ratchet wheel one tooth in the opposite direction. The solenoids act very quickly and the spring centers the mechanism without shock. Thus the ratchet wheel can be indexed rapidly in either direction at the will of the operator. No switching arrangement for sending the current through either of the solenoids is shown, but copper contacts set in the periphery of a revolving fiber or Bakelite disk can be arranged to furnish the intermittent electrical impulses necessary to energize the magnets so that each impulse will move the ratchet wheel one tooth in the desired direction.

The reversible ratchet mechanism shown could be used to actuate an elevator position indicator, for example. By using some of the parts and eliminating others, a self-locking device that will index in one direction only could be obtained. Such a device would be suitable for an automatic feed for a notching press. The writer has found numerous other applications for this device when used as a reversible ratchet with solenoid control or when controlled by mechanical means. In some cases, it has been used as a single-direction ratchet with either magnetic or mechanical control.

The electromagnets are used to set the mechanism and to stretch or extend one of the adjustable ten-

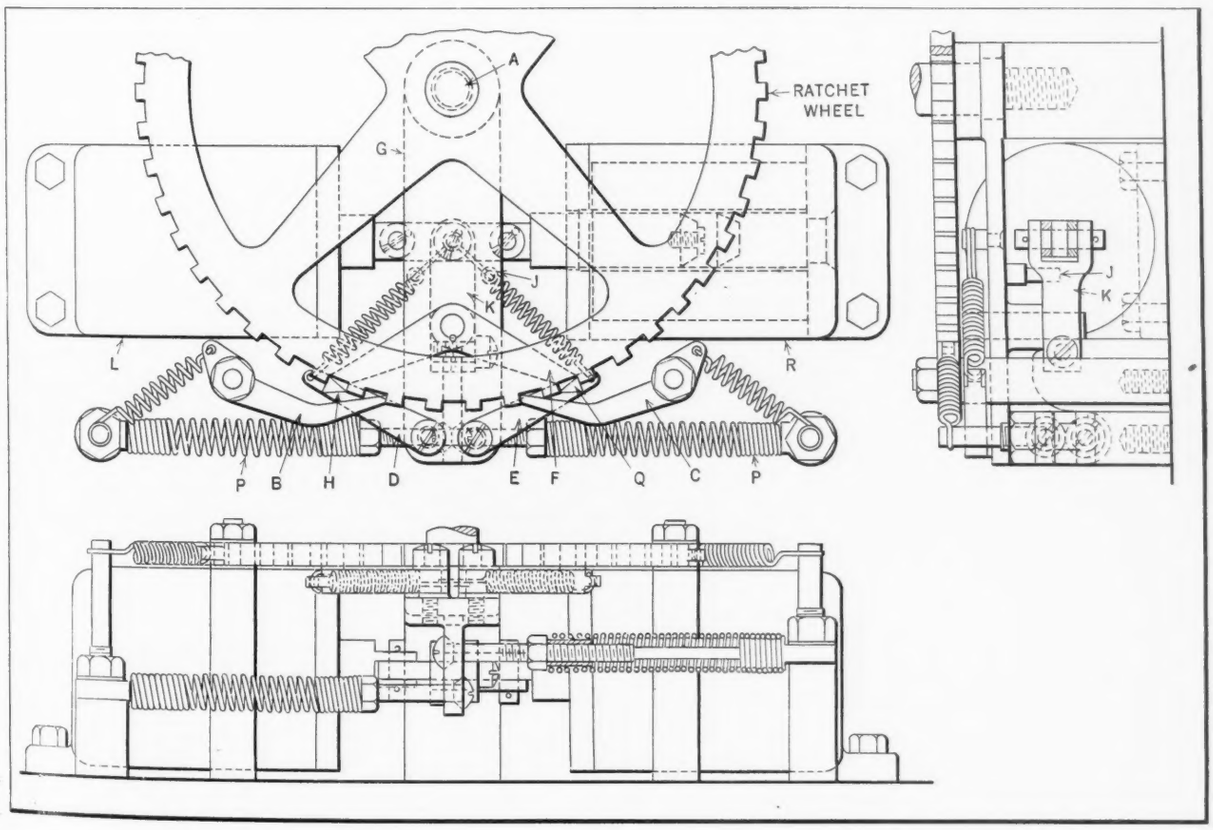


Fig. 1. Electrically Operated Ratchet Mechanism that can be Indexed Rapidly in Either Direction

sion springs *P*. These springs are adjusted to overcome the friction of the mechanism and of the machine part or work actuated by the mechanism. When these springs contract, they gradually exert less force on the parts actuated, so that there is less shock to the mechanism when the stopping pawl drops into its proper notch in the ratchet wheel.

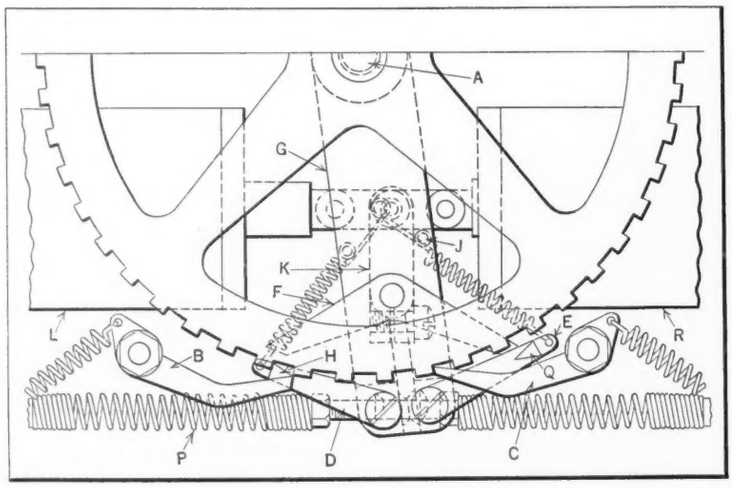


Fig. 2. Mechanism Shown in Fig. 1, with Working Parts in Positions Occupied on Application of Electric Current

No attempt should be made to improve this mechanism by using a solenoid to move the ratchet wheel, because the pull of a solenoid increases very rapidly as the length of the air gap in the solenoid is decreased. For instance, with an air gap 1 inch long, we might obtain a pull of, say, 5 pounds, but when the gap of the same solenoid has been decreased to 1/32 inch, the pull may be as high as 2000 pounds. The hammer blows delivered by the application of such force would flatten the end of the stopping pawl and the sides of the ratchet wheel. It would also cause a rebound of the parts, which would not give sufficient time for the stopping pawl to become properly seated, and the shock of the sudden stopping action might upset the parts actuated. Hence, an adjustable initial tension spring of sufficient strength to overcome the working friction of the mechanism and the parts actuated by it is the most satisfactory arrangement.

In considering the operation of the mechanism, let us first assume that an electric current is sent through the solenoid *R*. This causes arm *K* to be pulled to the right until it strikes the right-hand pin *J* on the arm *G*. This, in turn, causes the claw *F* on arm *K* to turn and move the pawl *E* so that the triangular projection *Q* is released from the slot in the ratchet wheel. Next, arm *G* moves to the right about the pivoting point *A*, pulling the triangular boss *H* of pawl *D* up the side of the tooth of the ratchet wheel. This action lifts the stationary locking pawl *B* from its notch, as shown in Fig. 2, and drops boss *H* into the notch formerly occupied by pawl *B*. At this point of the operation only pawl *C* is engaged. This pawl prevents the ratchet wheel from being moved in a counter-clockwise direction by the friction developed by the moving parts.

The tension spring *P* has now been extended, and when the current through the solenoid is broken, this spring returns arm *G* to the central position. The triangular projection *H* on pawl *D* pushes the ratchet wheel one tooth in a clockwise direction. Pawl *B* rides down the side of the triangular projection *H* and stops the movement of the ratchet wheel. Thus the ratchet wheel is rotated an amount equivalent to one tooth space and positively stopped each time the electrical circuit is completed and opened. The direction of rotation is controlled at the will of the operator, rotation in the opposite direction being obtained by making and breaking the circuit through solenoid *L* instead of solenoid *R*.

The springs for pawls *B*, *C*, *D*, and *E* are designed to give just sufficient tension to operate their respective pawls satisfactorily, while the initial tension centering springs *P* are adjusted to give just sufficient tension to move the work, the mechanism, and the plunger cores of the solenoids.

Fig. 1 shows the mechanism in a neutral position —that is, with no electric current applied to the magnets. The arm *K* is shown in a central position for clearness in illustrating the details, although this arm would probably never remain in this position when the mechanism was in use. It may be noted here that there is no need for the spring to be so adjusted that the arm *K* will be exactly centered when no current is passing through either of the solenoids.

Sliding Cam with Endless Groove for Reducing Cam Size and Stroke

By J. E. FENNO

In many automatic machines, sliding cams are employed for transmitting a straight-line movement to the tool or the work-holder, followed by a dwell to permit loading and unloading of the work. Frequently this dwell is unusually long, and the movement of the cam follower considerable; hence, a cam of the usual design would not only be large in proportion to other parts of the machine, but also would require an exceedingly long stroke. These objections are overcome with the cam shown in the illustration. This cam is positive, compact, and owing to its rather clever and simple design, only one-half the stroke of an ordinary cam is required to transmit the movements mentioned.

The cam *A* is supported at the ends *H* and *J* by suitable bearings, and is given a reciprocating horizontal movement by some member of the machine.

It has a continuous roll groove following a triangular path, and is equipped with locking plates *B* and *C* for retaining the roll *D* in the proper section of the groove. These locking plates are a sliding fit in the caps *E* and *F*, respectively, and are normally held in the position shown by coil springs.

In the position indicated, the cam has nearly completed its stroke toward the right. Further movement of the cam will cause the roll to depress the locking plate *B;* and at the end of the stroke, when the roll has reached the end of the horizontal section of the groove, the plate will once more return to the position shown.

As the movement of the cam is reversed, the roll is forced upward along the edge of the plate and finally into the groove, imparting a vertical upward movement to the follower arm *G*. This movement of the follower arm continues during the first half of the cam stroke. During the remainder of the stroke, however, the follower arm is returned to its starting point, after having passed the locking plate *C*, which is similar to plate *B*.

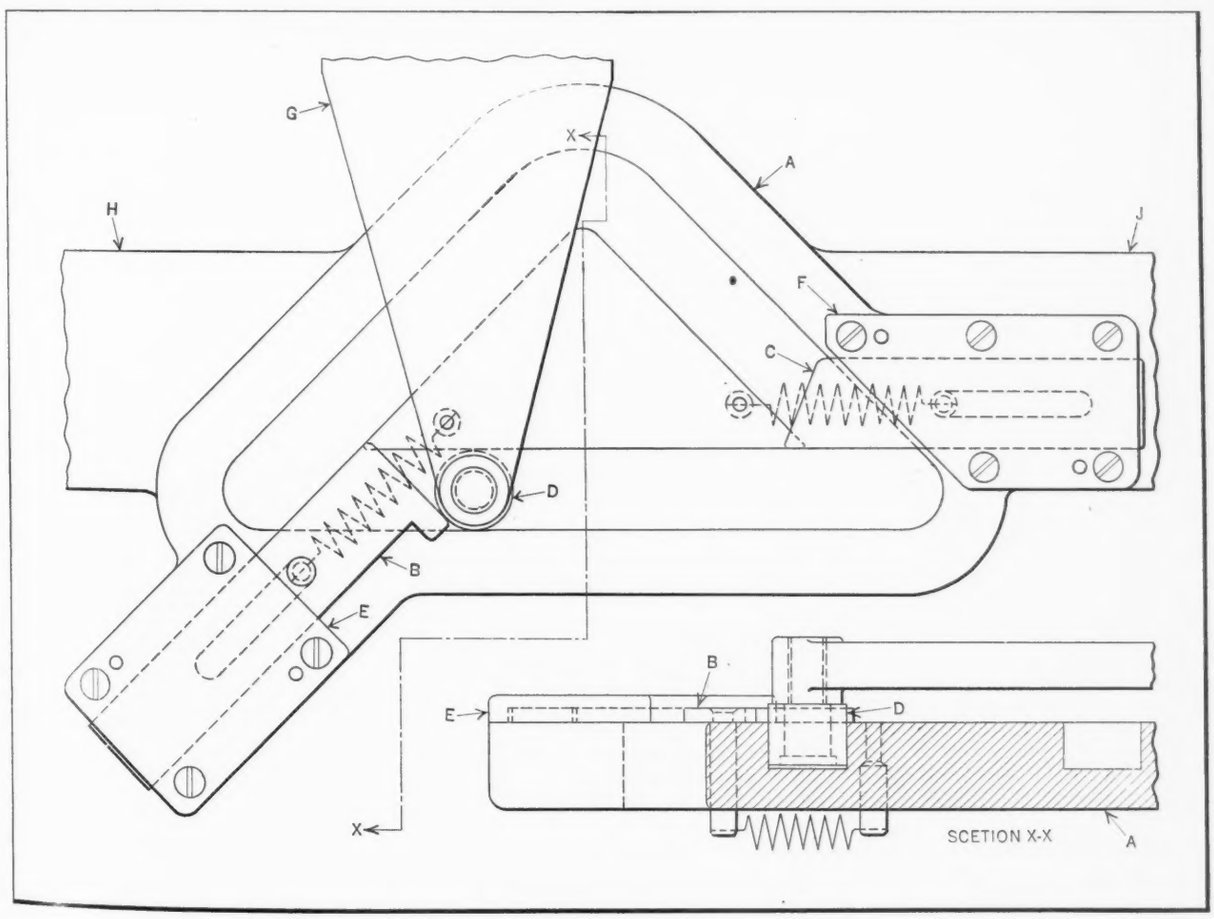
At this point, the movement of the cam is reversed and the roll simply rides in the horizontal section of the groove for the entire return stroke of the cam. During the latter stroke no vertical movement is imparted to the roll, and hence the follower arm *G* dwells at this time. This completes the cam cycle. The distance that the cam follower moves, as well as the timing, may be varied by changing the angle of the angular groove sections.

* * *

Photo-Electric Relay Used on Spring-Testing Machine

The Material Division of the U. S. Army Air Corps at Wright Field, Dayton, Ohio, uses an old punch press as a fatigue testing machine for shock absorber springs. The equipment operates twenty-four hours a day and a small counter indicates the number of times the spring is compressed. In the past, the difficulty was that when a spring broke during the night, the machine continued to operate and a wrong number of compressions was recorded.

The problem was solved by installing a General Electric photo-electric relay in such a position that the light beam passes beneath the bottom of the plunger when the plunger is in its lowest position. With this arrangement, the spring intercepts the light beam and prevents it from falling upon the photo-tube under ordinary circumstances. When the spring breaks, however, it collapses and the beam passes over it to the photo-tube, which actuates a relay and stops the operation of the machine.



Continuous-groove Cam in which Roll is Guided into Proper Groove Sections by Locking Plates

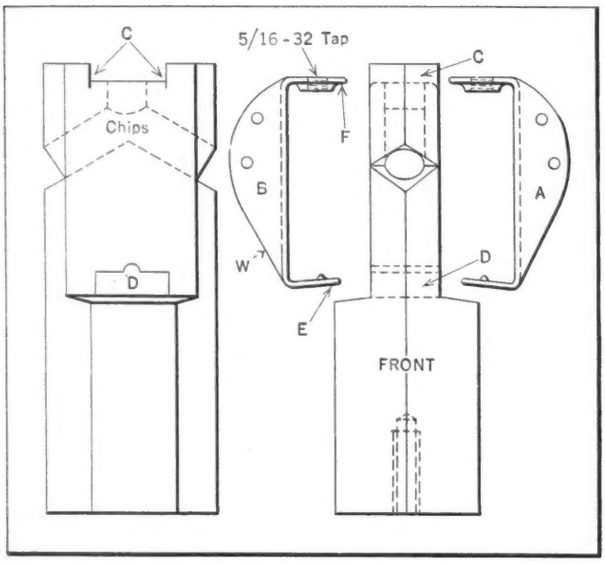


Fig. 9. Fixture Designed for Feeding from Both Sides Alternately

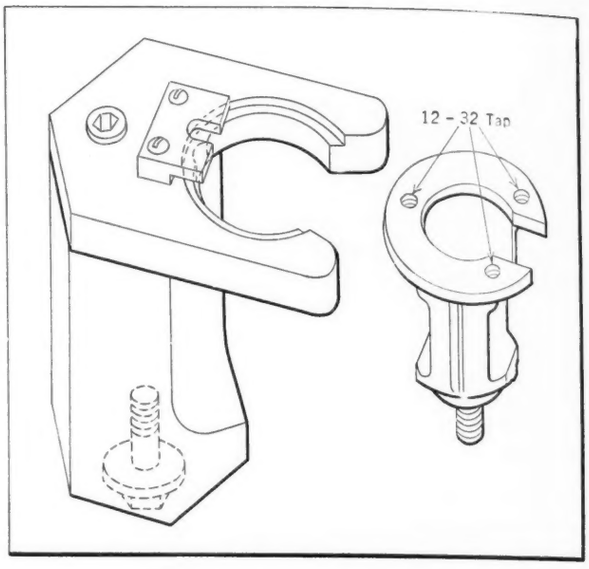


Fig. 10. Simple Fixture Used for Tapping Three Evenly Spaced Holes

Fixtures for Tapping Small Parts at High Speed

By H. GOLDBERG
Vice-President
R. G. Haskins Co.
Chicago, Ill.

IN the first article on this subject, which appeared in December MACHINERY, some of the fixtures designed and built by the R. G. Haskins Co., Chicago, Ill., for tapping operations on their high-speed tapping machines were described and illustrated. The present article continues the description of typical applications to these high-speed tapping machines. In Fig. 9 is shown a very simple double-sided tapping fixture for tapping the formed steel stamping *W*. Both sides of the fixture are used in this case; that is, the work can be placed in the tapping position from either side. This permits the use of both hands in feeding, first the right and then the left. The openings at *C* and *D* are made the proper width to prevent the part from turning. The projecting end at *E* is inserted in the slot at *D*, thus preventing the work from rising on the tap.

The fixture illustrated in Fig. 10 is employed for tapping three 12-32 holes in the brass forging shown to the right. This part is placed in the circular opening of the tapping fixture so that it rests on the rim. A hold-down block is provided to prevent the part from climbing up on the tap during the operation. The fixture is fastened to the tapping machine and the part indexed by hand for tapping the three holes.

Fixture for Tapping Castellated Nuts

The problem of tapping castellated aircraft nuts has been simplified by the use of the fixture shown in Fig. 11. On account of the knife-edges formed by the slots in these nuts, it was formerly necessary to perform two tapping operations, the first being

Data on High-Speed Tapping Operations Performed on Fixtures Shown in Figs. 9 to 14

View in which Fixture is Shown	Kind of Material Tapped	Size of Hole Tapped	Number of Holes per Piece	Kind of Tap Used	Speed of Tap, Revolutions per Minute		Production, Pieces per Hour	Cost of Fixture
					In	Out		
Fig. 9	0.050 C.R. Steel	5/16–32	1	3-flute H.S. gun	1500	3000	1600	$12
Fig. 10	Brass Forging	12–32	3	3-flute H.S.	3000	6000	750	$12
Fig. 11	1020 C.R. Steel	10–32	1	3-flute H.S.	2300	4600	1250	$39
Fig. 12	Invar Metal	0.050–64	3	.....	....	....	....	...
Fig. 13	C.R. Steel	Varies	1	.....	....	....	1100 to 1600	...
Fig. 14	(A) Permaloy	8–32	2	2-flute gun	1750	3500	900	...
Fig. 14	(B) Molded Bakelite	8–32	2	3-flute nitrided	1500	3000	1000	...
Fig. 14	(C) Brass Forging	12–24	2	3-flute gun	3000	6000	1050	...

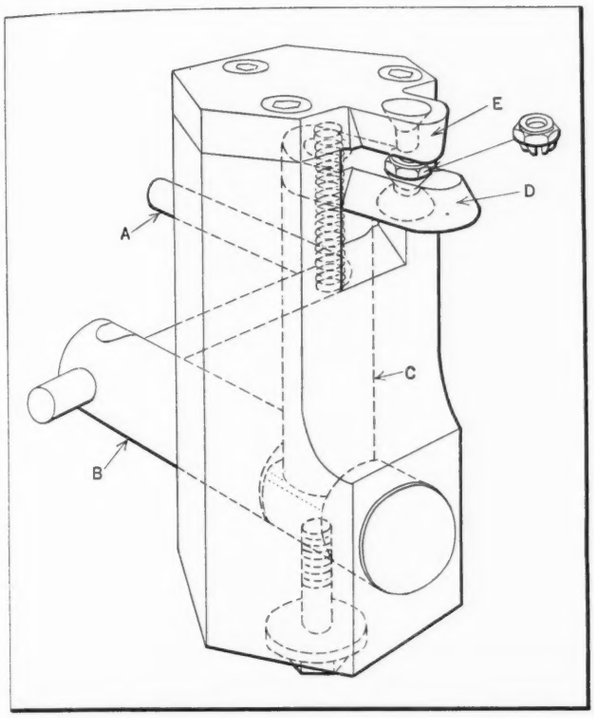


Fig. 11. Fixture Designed for Tapping Castellated Nuts

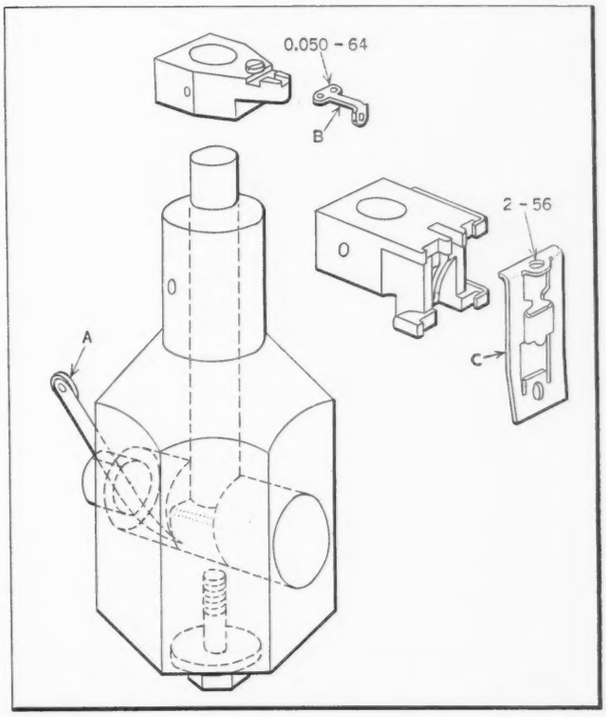


Fig. 12. Sensitive Type of Tapping Fixture for Small Holes

performed before the blanks were slotted, while the re-tapping operation simply removed the burrs produced by the slotting cutters. With the fixture shown, the tapping is completed in one operation without tap breakage or other difficulty. It has been found possible to maintain a "Class 3" fit on the tapped threads, due largely to the efficient method of clamping and the support provided for the slotted portions of the blanks, which prevents them from opening while being tapped.

A slight forward pull on the handle *A* of the fixture turns the camshaft *B*, which raises the spindle *C*. This causes the clamping plate *D* to grip the nut tightly against the upper plate *E*. In operating the fixture, a blank nut is placed in the countersunk hole in *D* and handle *A* pulled forward. The nut is automatically straightened up or aligned and clamped tightly against plate *E*. After the tapping operation, handle *A* is pushed backward to release the nut. The new nut, when placed in position, pushes the tapped nut out into a container.

A very sensitive master fixture for tapping threads in sizes from 0–80 to 2–56, and not over 1/4 inch deep, is

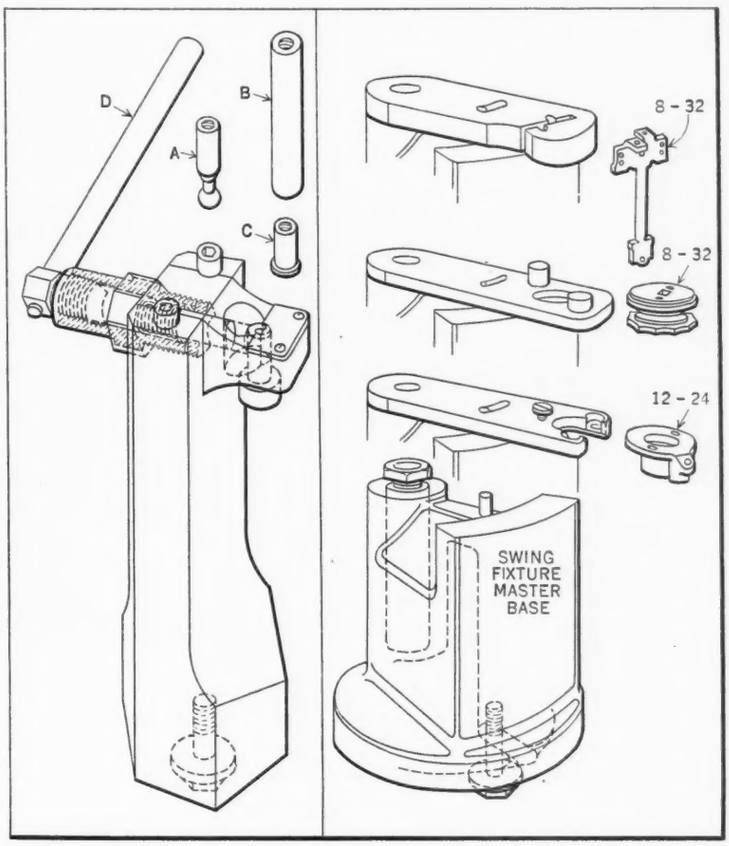
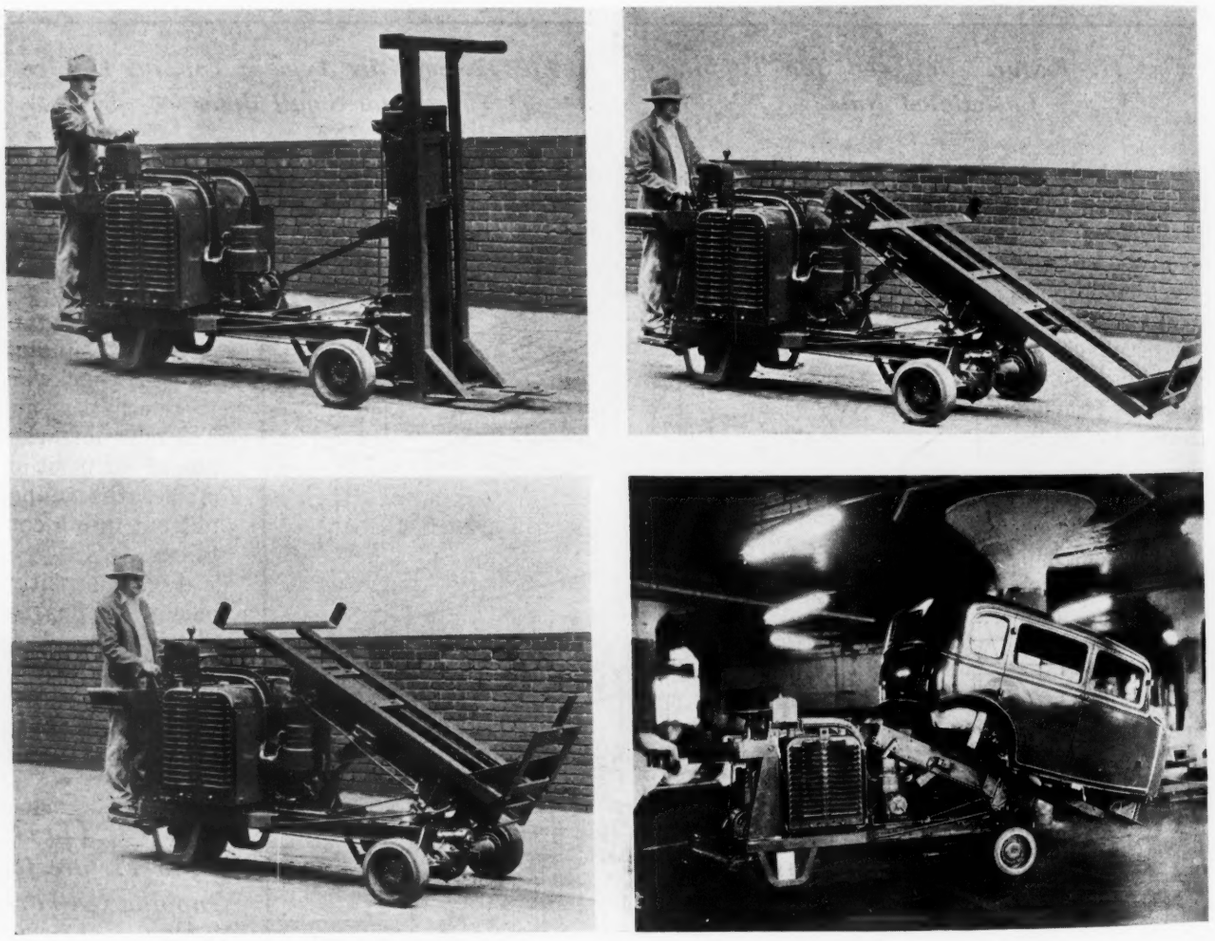


Fig. 13. (Left) V-jaw Fixture for Tapping Cylindrical Pieces Lengthwise. Fig. 14. (Right) Swing-type Fixture with Interchangeable Work-holding Arms

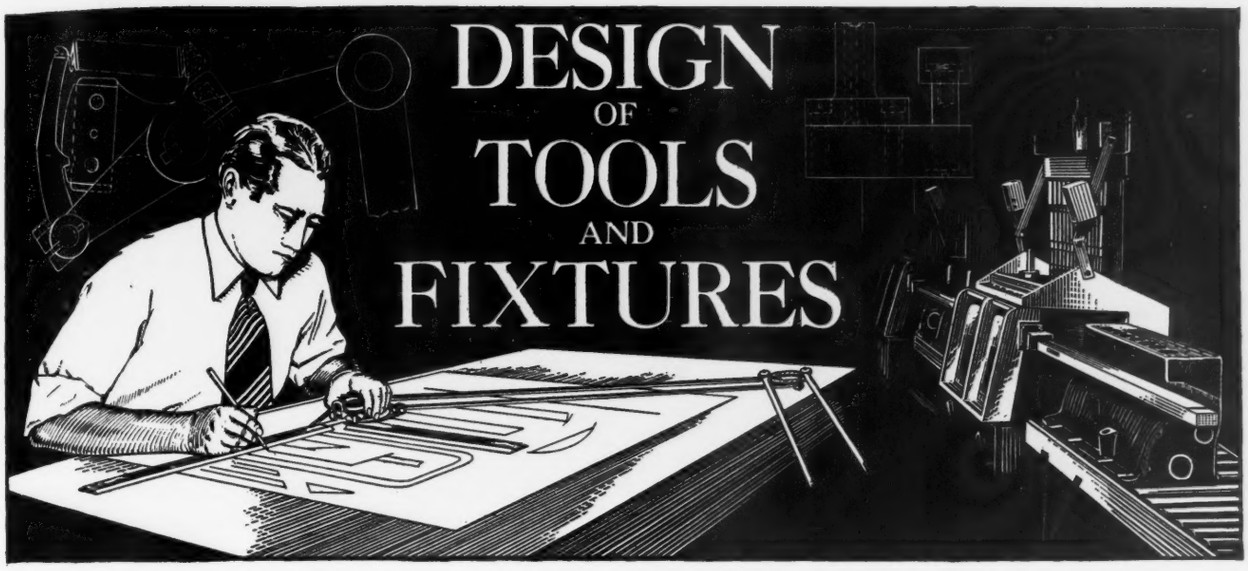
shown in Fig. 12. This fixture is used mainly for very sensitive tapping where the inertia of the feeding member of the machine itself is too great. The tap and fixtures for the different pieces to be tapped are fastened to the main spindle by two set-screws. The main spindle is raised by operating the lever *A*. The part shown at *C* is a steel stamping with a 2–56 tapped hole. This piece is simply placed on the fixture and the lever *A* pressed down and then released. This simple operation serves to complete the tapping operation. The part shown at *B* is a stamping made of Invar metal and has three tapped holes in it, 0.050 inch with 64 threads. The pieces shown at *B* and *C* are typical examples of the pieces tapped on this fixture. The average production on pieces of this kind ranges from 1100 to 1700 pieces per hour.

The fixture shown in Fig. 13 is designed for the rapid tapping of small cylindrical pieces, such as shown at *A*, *B*, and *C*. Less than one-quarter turn of the lever *D* is required to lock the piece against a V-jaw in the aligning portion of the fixture. The clamping plunger has a movement of approximately 1/4 inch, and a stop-plate is fastened on the top, the work being placed up against this plate from underneath. After the operation, a movement of the lever releases the work, allowing it to drop out and leaving the fixture ready to receive another piece. This has proved to be an ideal arrangement for performing a second tapping operation on parts produced at high speed on screw machines. This type of fixture is made for tapping holes in rod ranging from 1/8 to 1 inch in diameter. The production rate usually averages from 1100 to 1600 holes per hour.

In Fig. 14 is shown a swing-type fixture for use in tapping pieces having two or three holes. The outer ends of the swinging arms are machined to receive the pieces to be tapped and provided with stops and hold-down members as the nature of the work requires. With a fixture of this kind, the work-holding arm is swung into position for tapping a hole and then swung around just far enough to locate the second hole in the tapping position.



Automobile Bodies Stored by the Aid of an Electric Truck. At the Upper Left, the Truck is Shown with the Tilting Frame Upright, as in Picking up or Unloading an Automobile Body. At the Lower Left, the Frame is Tilted into the Normal Position for Transporting an Automobile Body. At the Upper Right, the Member that Holds the Automobile Body has been Slid Downward, as when a Low Doorway Must be Cleared. The Lower Right-Hand View Shows a Body on the Truck. The Truck Shown in These Illustrations is a Development of the Elwell-Parker Electric Co., Cleveland, Ohio.

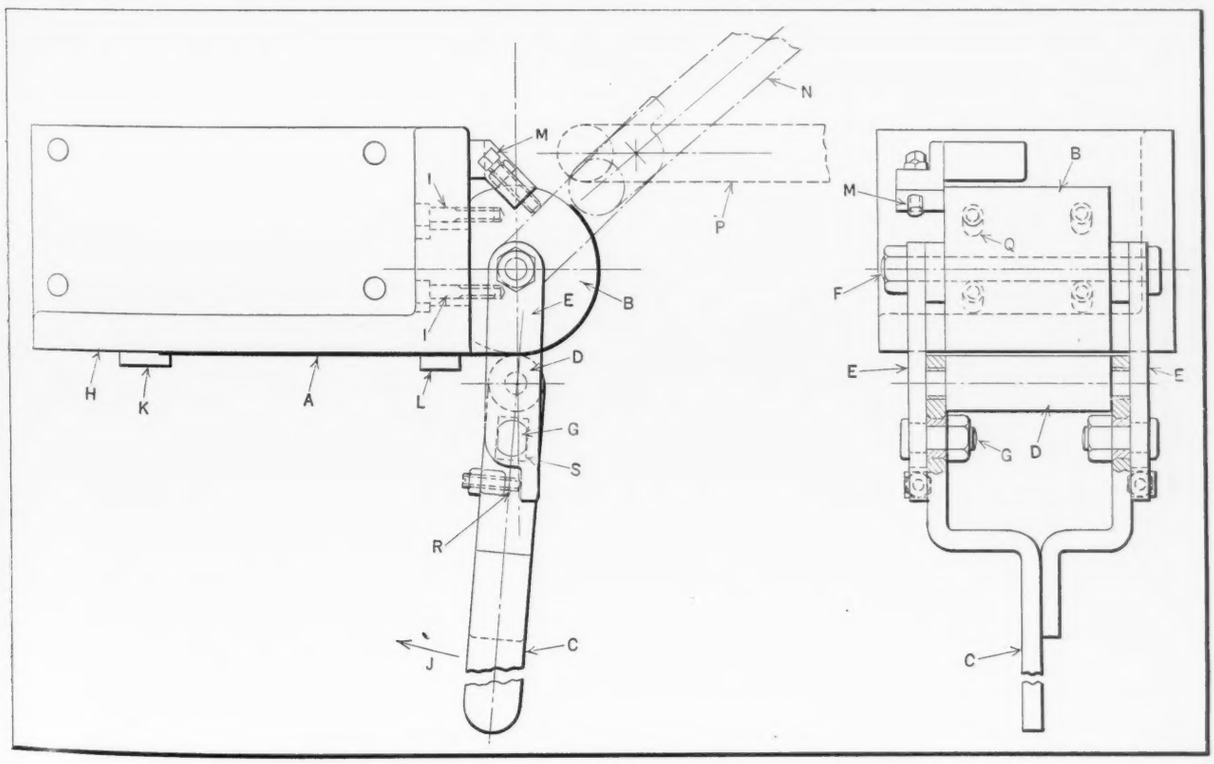


Hand-Operated Bending Fixture for Sheet-Metal Parts

By EDWARD HELLER, Cleveland, Ohio

Sheet-metal parts, such as shown at *A* in the accompanying illustration, were required to be bent to shape from blanks 4 1/2 inches wide by 12 inches long, cut to size from 16-gage stock. The number of parts required did not justify the cost of equipping or setting up a punch press for the bending operation; and as the parts were used at some distance from the punch press department, it was thought best to make up a bending fixture that could be mounted on a bench in the department where the pieces were assembled.

The difficulty in designing a bending fixture of this kind is to determine the shape and size of the bending form and the location of the roller on the bending lever. These elements must be designed with the correct allowance for spring-back, so that the finished part will have the required shape. Perhaps the most interesting feature of the fixture shown is the provision made for changing the form-



Fixture for Bending Sheet-metal Parts to Shape Shown at A

ing block and the position of the bending roll to obtain the proper allowance for spring-back and thus produce the desired results.

The working parts of the fixture consist of the form *B* and a forked lever *C* carrying the forming roll *D*. The roll-lever is connected to the form by means of the links *E*. These links have pivot bearings on the long spindle *F*, so that they can be swung about form *B*. Roll-lever *C* is pivoted on the studs *G*. Form *B* is simply a piece of shafting flattened on one side and fastened to a heavy cast-iron base *H* by screws *I*. The base, in turn, is fastened securely to the bench where the tool is used.

In operation, lever *C* is pivoted slightly in the direction indicated by arrow *J*. This movement gives a generous opening between form *B* and roll *D*, making it easy to slide the work in between a pair of guides (not shown) and up against the stop *K*, where it is held in place by a pair of clamps *L*. The work is then formed by pulling lever *C* around in a counter-clockwise direction until one link *E* strikes the adjustable stop-screw *M*, as shown by the dot-and-dash lines *N*. To facilitate the removal of the work, lever *C* is pivoted about studs *G* until it assumes the position shown by the dotted lines at *P*. The clamps *L* are then released and the formed part removed. The bending lever can now be brought back to its starting position.

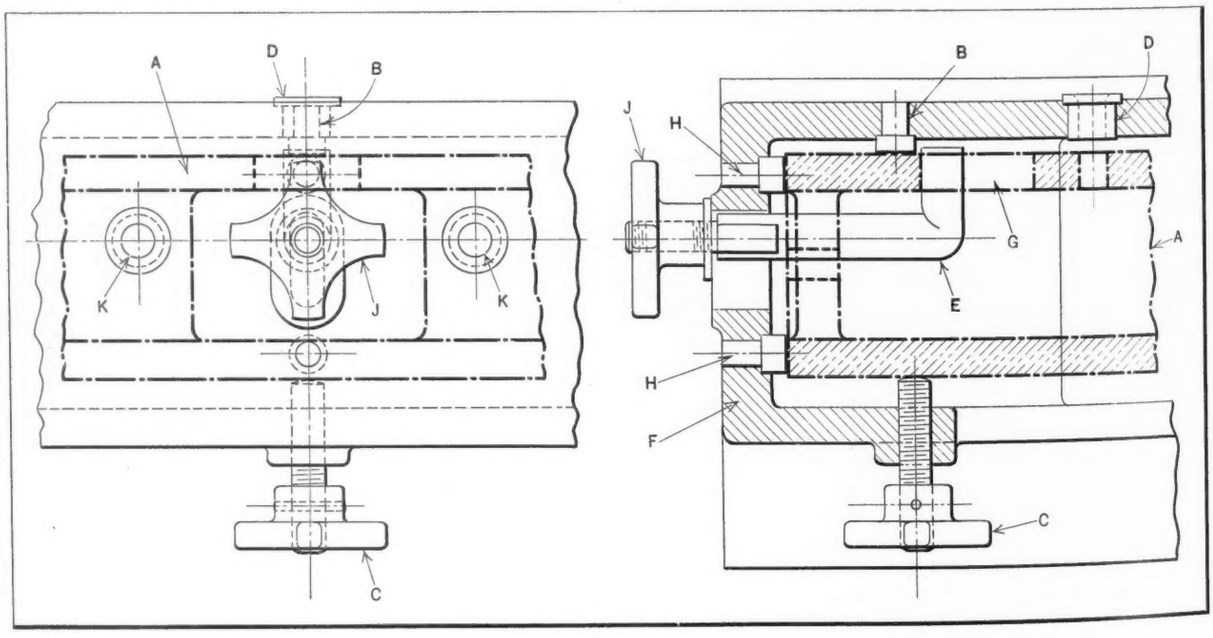
In designing the fixture, a number of blanks were bent by hand over round surfaces of different sized radii until an experimental radius was determined upon. This radius was then increased by 1/8 inch and form *B* turned up and fastened to the base casting, after which the rest of the parts were made up, and the fixture assembled and tried out.

On the first test, form *B* was found to be too large. It was, therefore, turned down a small amount and reassembled. In order to bring the form back to a position tangent with the long face of the base, it was necessary to adjust it. This was made possible by having the slots *Q* somewhat elongated. Roll *D*, being too far away from form *B* after this adjustment, was relocated by removing the rectangular blocks *S* which form bearings for the studs *G* and filing off each block the proper amount. Filler pieces were then placed on the opposite ends of these blocks to make them tight in the slots in lever *C*.

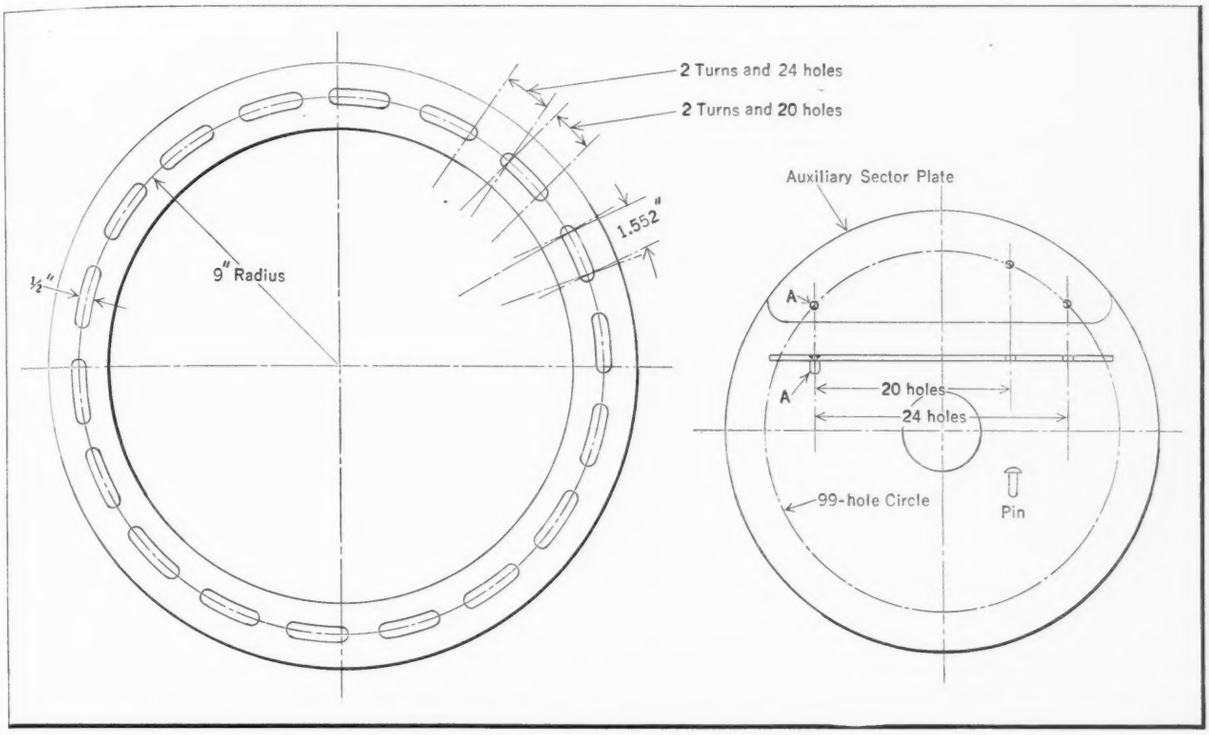
The fixture was reassembled and tried out after making these adjustments. Although this procedure could be repeated a number of times, the first experiment was performed so well that only one readjustment was necessary to make the tool operate properly. The screws *R* which bear against the ends of the links *E* can be adjusted to vary the shape of the bent part to some extent. As soon as the proper size and position of form *B* were determined, it was doweled in place. New inserts *S*, having the stud hole in the proper place, were also made and inserted in the lever *C*. The location of gage *K* in its proper place completed the job.

Clamping Methods for Jig Used in Drilling Long Castings

A machine casting of considerable length with a box-shaped cross-section, such as shown at *A* in the illustration, proved to be a difficult part to clamp in the drill jig until a series of holes *G* were cast in one of its sides. These cast holes made it possible to employ hook-bolt clamps *E*, which provided a convenient and quick method of clamping. The illustration shows only a short section of the central portion of the work and jig.



Section of Drill Jig and Work, Showing Method of Clamping Long, Box-like Castings



Auxiliary Sector Plate Used in Spacing Milled Slots in Work Shown at Left

The work *A* is pushed against two pins *B* by two screws operated by hand-knobs like the one shown at *C*. Bushings *D* serve to guide the drills. The hook-bolt *E* passes through an elongated slot in the frame *F* of the jig and enters the hole *G* in the work, clamping the work against the pins *H* when the hand-knob *J* is tightened. The portion of bolt *E* that passes through the slot in the jig wall has flattened sides to prevent it from turning when knob *J* is tightened. The hooked end of the bolt is merely slid out of hole *G* to remove the work. All movements of hook-bolt *E* are controlled by knob *J*.

Bushings *K*, of which two are shown, constitute part of a battery for guiding drills through the upper surface of the work. Several hook-bolt units such as the one illustrated are spaced along the full length of the jig, and pins *H* are located directly opposite these bolts at each clamping point. Side clamping bolts operated by knob *C* are used only near each end of the work. H. M.

Simple Counting Plate for Preventing Errors in Indexing

By WILLIAM C. BETZ, New Britain, Conn.

When an indexing head is used for spacing or dividing circles into chords or segments of two different lengths, with the long and short lengths alternating, it is very easy to become confused in the number of holes to be indexed for each movement. For example, mistakes might easily be made in the indexing movements required for the center-to-center spacings for the radial slots in the plate shown at the left in the accompanying illustration. As indicated, two turns and twenty-four holes in the 99-hole circle of the indexing plate are required for the spaces, and two turns and twenty holes in the same circle for the slots.

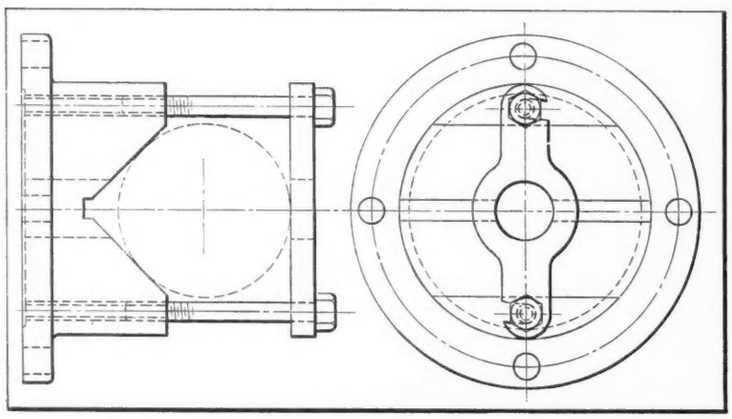
While there is little chance that a mistake will be made in the number of complete revolutions of the indexing crank required for the spacing movement, extreme care must be taken to avoid confusion between the 20-hole and the 24-hole additional movements required for the two different spacings. However, such errors are not likely to occur when the simple device shown in the view at the right is used.

The auxiliary index counter is simply a piece of sheet metal, laid out and drilled as shown by using the index-plate as a jig. A small hole was drilled in the plate at *A*, into which a pin was riveted. This pin was about 1/4 inch in length and was machined to a close fit for the spacing holes in the index-plate. The pin was inserted in one of the holes in the 99-hole circle of the index-plate, after which the plate was used as a guide for drilling the holes for the 20- and the 24-hole spacing. The small pin shown in the illustration was made with a shallow head and of the proper size to fit the holes in the index-plate and the auxiliary plate. This pin served two functions—holding the auxiliary counter plate in place and preventing mistakes in indexing, as it was inserted in the hole not to be indexed.

The procedure in machining the holes in the plate illustrated was as follows: First, the index-pin was

set to the 99-hole circle with the sector adjusted to index for eighteen equally spaced holes. Four complete turns and forty-four holes were required for this spacing. After drilling the eighteen holes, the index-pin was withdrawn and the stud *A* of the auxiliary sector counting plate inserted in its place on the main indexing plate. The pin with the shallow head was then inserted in the 24-hole position of the auxiliary plate, leaving the 20-hole space open for the indexing pin. Two turns and twenty holes were then indexed, and a hole drilled in the work, giving the first chordal position for the slot required. The auxiliary plate was then removed and the regular sector for eighteen equally spaced holes brought into use. After completing the second group of eighteen equally spaced holes, the work was indexed two turns and twenty-four holes to bring the end-mill into line with the first hole drilled. The pin *A* of the auxiliary spacer was then inserted in the hole from which the indexing pin was withdrawn. Next, the shallow-head pin was placed in the 20-hole spacing position. The indexing crank was then turned two turns and twenty-four holes to bring the work into position for milling the slot.

Leaving pin *A* in position, the shallow-head pin was again changed to the 24-hole space in the auxiliary plate and the milling operation allowed to proceed for an angular movement equivalent to two turns and twenty holes. The machine table was then lowered to bring the milling cutter out of contact with the work, the shallow-head pin removed to the 20-hole space, and the work turned two turns and twenty-four holes to bring the cutter into position for the next cut. The auxiliary plate was used during the whole process of milling the slots, first being set to register twenty holes and then twenty-four, which, with two whole turns in each indexing movement, equals four turns and forty-four holes for eighteen equal divisions.



V-block with Flange for Attaching to Lathe Faceplate

Lathe V-Block for Drilling Cross-Holes

By CLIFFORD CORNWALL, Toronto, Canada

A useful fixture for the tool-room, contract shop, or production department is shown in the accompanying illustration. It is intended for use in boring accurately centered cross-holes in cylindrical parts when a high degree of accuracy is necessary.

The fixture has a flange for attaching it to the faceplate of a lathe. The flange is finish-turned and the work-locating V-slot is accurately centered. This permits truing up on the flange with an indicator to insure an accurate set-up. The flange may be dispensed with, however, and the block threaded from the back to fit on the spindle nose when such an arrangement will maintain the degree of accuracy desired. The clamping arrangement shown is simple and effective, but can be changed to suit special requirements. Clearance holes for the drill or boring tool are provided in both the clamp and the base of the block.

* * *

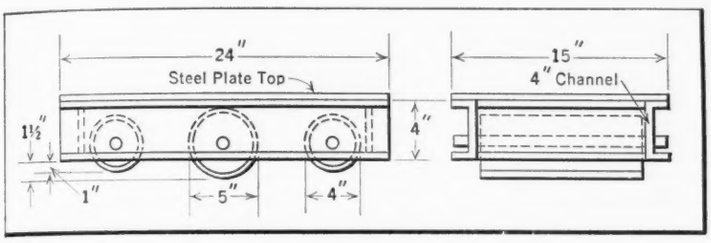
It is my firm conviction that every man is entitled to a chance to work. His natural state requires that he be engaged in producing, transporting, or selling the things his fellow men need. Idleness is a social disease, demoralizing and degenerating in its effect upon our social body. Greatest of all the problems of surplus faced by humanity during the last few years was that huge and growing surplus of labor. As men were thrown into idleness, their ability to purchase and consume the products of other men was nullified. Thus unemployment bred more unemployment and we were hurrying dizzily down a spiral whose bottom represented complete and total collapse of our entire social and economic system.—*P. W. Litchfield, President, The Goodyear Tire & Rubber Co., in the Executives Service Bulletin*

* * *

Millwrights who have occasion to drill holes in masonry will be interested in a new three-point masonry drill known as the "Rawldrill," manufactured by the Rawlplug Co., Inc., 98 Lafayette St., New York City. The advantages claimed for this three-point drill are that it is easy to resharpen on any grinding wheel; that it has a longer life than the usual type of masonry drill, since it can be used until it is worn right down to the shank; that the parallel sides of the cutting lips insure an accurate hole; and that breakage of drills is reduced to a minimum.

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work



Truck for Moving Heavy Machinery

Truck for Moving Heavy Machinery

A truck or dolly made as shown in the illustration will be found very useful around the shop for moving heavy boxes, machines, etc. It can be used to best advantage when positioned under the center of the box or machine to be moved, as it can then be turned or swung around on the center roll. The two small rollers serve to limit the movement of the load when it is not balanced on the center roll. When used for unloading, the material can be transported to the desired location over rough floors or roadways on which the standard truck or dolly would be useless.

The frame is made from 4-inch channel iron and the top is covered with 3/8-inch steel plate. The rolls, made from iron pipe, are connected to the side members with 1 1/4-inch steel axles, secured to the side frames, roller bearings being used inside the pipe rollers. The dimensions shown in the illustration have been found satisfactory for average work, but the same design can be used for larger sized trucks, such as are required for very heavy loads.

Denver, Colo. R. M. THOMAS

Designing Dowels to Facilitate Their Removal Hydraulically from Blind Holes

Some enterprising dowel-maker should place on the market a dowel having a small hole drilled through its entire length, and should supply with each lot of dowels a drift-pin to fit this hole, in the same manner that makers of socket screws provide a wrench with the screws.

To remove such a dowel from a blind hole, one would merely fill the center-hole with oil, insert the drift, and give it a smart tap with a hammer. In most cases, the dowel would shoot out like a rocket at the first blow. A tightly fitting dowel might require several blows. Adding the center-hole would, of course, increase the cost of the dowels, but their application could be limited to cases where through holes were impractical. E. D. H.

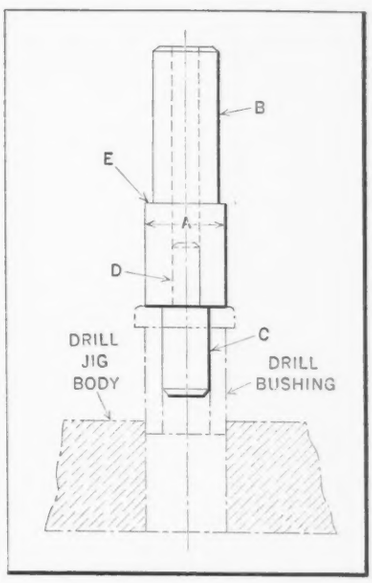
Tool for Inserting Drill Bushings

In pressing drill bushings into holes in the body of a jig or a bushing plate, care must be taken to start the bushing straight in the hole. To accomplish this, a number of bushing-aligning tools, such as shown at *B*, were made. Since commercial bushings are made in only about half a dozen diameters, the diameter of the tool at *A* is made with a slip fit corresponding to the outside diameter of one of the standard bushing sizes, and different sized pilots, such as shown at *C*, are made for each tool, as required. The shanks of the various sizes of pilots *C* fit snugly, but not too tightly, in the tool at *D*. This permits the pilots to be changed easily and quickly.

The tool for inserting the bushing is clamped securely in a drill-press spindle with the shoulder *E* against the jaws of the chuck. The jig in which the bushings are to be pressed is placed on the table of the drilling machine and lined up with the tool. This is done by lowering the tool, so that *A* enters the hole in the jig, in which it is a slip fit. The spindle is then raised, the bushing placed on the pilot *C*, and fed down into the hole.

In most cases, the work can be completed in the drill press. However, when the bushing fits too tightly to be pressed all the way in by the drilling machine spindle, but can be pressed in far enough to insure proper alignment, the parts can be removed to an arbor press for final assembling.

EDWARD HELLER
Cleveland, Ohio



Tool for Aligning and Pressing Drill Bushings into Place

Turret Lathe Equipment for Boring and Threading Oil-Well Casing Couplings

By P. H. BRYANT

A CONSTRUCTIVE criticism of tool equipment sometimes leads to the development of a new and interesting design. For example, turret lathe equipment designed for boring and threading oil-well casing couplings was criticized simply because it took up too much floor space, and as a result the twin-bar tool shown in Fig. 1 was developed. This complete equipment occupies only one position on the platen or main carriage of the turret lathe, whereas the previous equipment occupied several positions on the turret, with some of the bars extending 3 1/2 feet from the turret center.

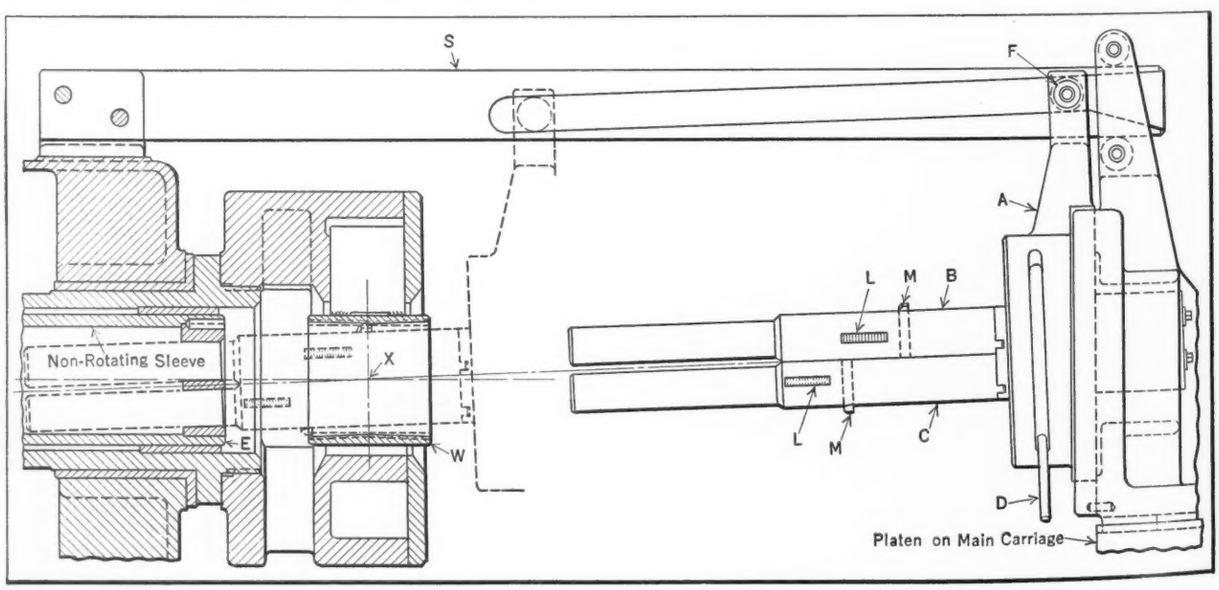
The coupling *W* to be machined is held in the jaws of a special chuck, as shown, a locating gage being used to position the center of the coupling at point *X* where the center line of travel of the tool crosses the axis of the lathe spindle. The twin boring and threading bars *B* and *C* of the tool are mounted on a vertical slide *A* at an angle corresponding to the angle of the thread taper in the coupling. A non-rotating sleeve *E* in the lathe spindle is provided with guide bushings set at the correct angle to guide and support the pilot ends of the boring-bars. The roller *F* on tool-slide *A* travels in a slot in the bar *S*, which is parallel with the center lines of the boring-bars. This arrangement guides and supports the tool-slide, thus causing the tool to travel at the angle required for boring and threading the coupling.

The lower cutter *M* bores the tapered portion in the rear half of the coupling, while the upper cutter *M* bores the tapered portion at the front end. The two tapered surfaces thus finished meet at the center of the coupling. After the boring operation is completed, the boring-bars are rotated by means of handle *D* to bring the thread chasers *L* into their respective cutting positions. Then the spindle is reversed and the threading of the two tapered portions is completed on the return or outward feeding movement of the tool.

Originally, the tool was designed and used to take the threading cut on the inward feeding movement, which, of course, required the cutters to remain idle while the tool was being withdrawn, after the boring operation, in preparation for threading.

Reversing the direction of rotation of the work and threading on the return movement permitted the boring and threading to be completed in one inward and outward movement. With the latter method, it was necessary to lock the chuck to the spindle, so that it would not unscrew when the direction of rotation was reversed. The two boring-bars have only 0.001 inch clearance between them, which is taken up during the machining operations,

Fig. 1. Tool Equipment for Boring and Threading Both Ends of Coupling in One Inward and Outward Feeding Movement of Lathe Turret



due to the diametrically opposed positions of the cutters. As the bars are rotated in the same direction while being indexed from the boring to the threading positions or vice versa, the tendency is to throw the chips away from the line of contact, so that they will not become wedged between the bars.

The three views in Fig. 2 show diagrammatically the respective positions of the tools when boring and threading, as well as when the rapid traverse takes place on the return movement. This arrangement, however, was used in the original design before adopting the method of threading on the return movement. A cam and segment gear mechanism for rotating and locking the bars in their proper positions for boring and threading is contained in the head of the tool-slide *A*.

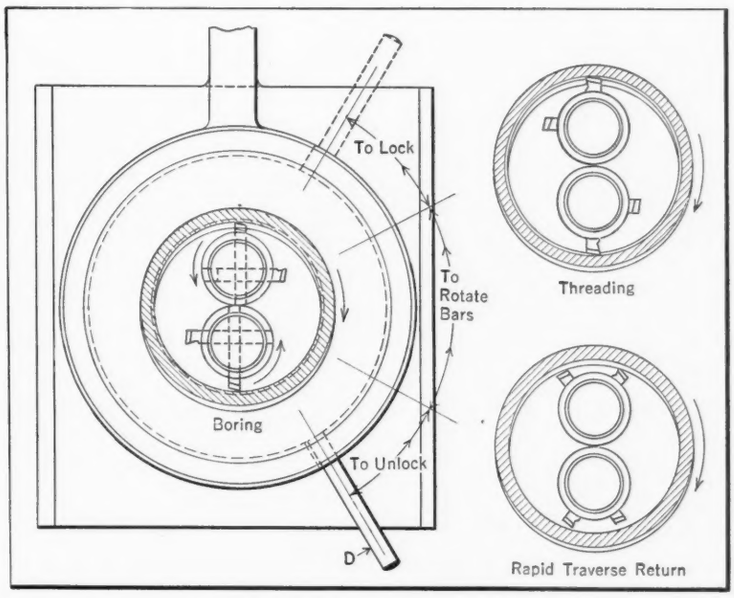


Fig. 2. Diagrams Showing Method of Indexing Twin Boring-bars from the Boring to the Threading Positions

* * *

Progress is Made by Evolution, Not by Revolution

In an address before engineering educators, C. F. Hirshfeld, chief of the research department of the Detroit Edison Co., and chairman of the Engineers' Council for Professional Development, gave expression to the idea that we must not expect successful results from revolutionary methods in science, education, or political life. Progress is the result of evolution, not revolution.

"We are living in a period in which it has become the style to question with the utmost freedom practically everything having to do with the life of man," Mr. Hirshfeld said. "Religious forms and teachings, social organizations and values, economic theories and practices, the significance of family life and family ties, physical science, which was thought by many to rest on an absolutely unassailable foundation, all these and more are being subjected to an inquisition of unprecedented character and extent.

"It is commonly held that out of this chaos there is to emerge a new social, economic, and cultural order resulting from a revaluation of that which has been and a reorientation with respect to that which is to be. I find myself unable to travel with the mob in these respects. To me, we shall end by discovering once more the reality and significance of certain eternal verities, or at least verities which shall be such for so long a time that for our present purposes we may regard them as eternal.

"History does not show any case in which an existing order, an existing culture, or an existing anything else of significance has been thrown away over night and successfully replaced by new somethings created full-grown from the brain of man. And I do not believe that we have suddenly become such superhuman individuals that we can accomplish successfully such a superhuman task.

"I feel very certain that we shall shortly realize that man is man, that in spite of a large admixture of idealism in the mass, he is actuated very largely by considerations of self interest as an individual. Moreover, I believe that we shall also realize that no workable social organization can be produced which does not take this into account, and, therefore, provide for the rather generous exercise of the individualistic urge.

"If the industrialist insists on producing more shoes or more automobiles, or more anything else, than the market requires, no governmentally hatched and administered plan is going to make the world pay more than the product is worth to it."

* * *

Zinc in Relation to Health

In view of the fact that many parts of food-mixing machinery are being die-cast, an article in *Public Health Reports*, Volume 48, No. 32, published by the Government and obtainable from the Superintendent of Documents, Washington, D. C., at the price of 5 cents, on the subject, "Zinc in Relation to General and Industrial Hygiene," is of particular interest and importance. In this article, Dr. Drinker and Dr. Fairhall of the Department of Physiology of Harvard University, make a thorough examination of the effects of zinc and zinc alloys on foods and beverages. The article should be of value to all who are interested in the use of zinc and zinc alloys.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

C. E. A.—In November, 1931, MACHINERY, is described a process for the reverse drawing of conical shells. I would like to know the reasons for turning the shell inside out.

Answered by Paul H. White
St. Louis, Mo.

In the process of drawing metals, especially sheet steel in the lighter gages, forming in any other direction than parallel with or at right angles to the travel of the ram of the press presents difficulties. The drawing of a cylinder from a flat blank, for example, is quite simple. However, if the finished article must be conical in shape, a great deal of care is necessary to make a smooth draw.

In the article referred to, the dies were first made up for drawing in successive stages from the blank to the completed cone. After considerable experimental work, the finished part was finally produced by four separate operations. A great deal of waste occurred, as many of the shells ruptured in the second or third draw. When it was proposed to try the reverse drawing method, the first trial proved successful, and the parts were completed in two instead of four operations. The shells were formed smoothly over the tapered center plug; and when the proper depth was determined for the first operation, the flange at the open end was finished perfectly flat and at right angles to the axis.

The Making of Slush Castings

J. W.—I am using a lead and antimony alloy for the making of slush castings. What is the best composition of a lead and antimony alloy for slush castings, and at what temperature should this alloy be poured?

Binding Power of Verbal Contracts

T. C. B.—Please explain the differences between a written and a verbal contract. Can a party who files suit on a written contract prove verbal agreements?

Answered by Leo T. Parker, Attorney at Law
Cincinnati, Ohio

A valid contract is a lawful transaction between two or more parties resulting in each of the persons being obligated to perform one or more predetermined acts. A valid contract may be written or oral, expressed or implied. Generally, a verbal contract is as binding as a written one.

The legal difference between a written and an oral contract is that in a legal controversy involving an oral contract, the party who filed suit must prove the obligations assumed by the other party. However, the Court itself construes an unambiguous written contract, and no verbal agreements can vary the written terms.

On the other hand, it is important to know that if a written contract is ambiguous, or its terms are not clearly understandable, then testimony of verbal agreements will be received by the Court to determine the obligations assumed by each party. Then, again, if a contract is only partly written and other obligations or explanations are verbal, the Court will consider both the written agreement and the oral conversation in order to arrive at a definite decision with respect to the actual intent of each party to assume the obligations.

However, it must be remembered that although a complaining party to a contract states that the agreement is partly written and partly verbal, a Court will not receive testimony relative to the alleged oral portion of the agreement, if such testimony will in any manner or sense vary the terms of the written obligations. In other words, testimony showing verbal understandings will not be received when it is apparent that the verbal agreement is inconsistent with the written one.

* * *

All Over the World Somebody Gets Work from a Single Construction Job

Thirty states and several foreign countries profited by purchases made in a recent factory construction job completed by the Austin Co., engineers and builders, of Cleveland, Ohio, according to an analysis recently made by the officers of the company. The plant being built cost $450,000. Basic industries in thirty states were able to employ labor to the extent of over 800,000 man-hours through the orders placed for materials. Some materials not available in this country came from abroad. In addition, in the manufacture of the materials obtained from domestic manufacturers, many important materials from abroad had to be used, so that, as a matter of fact, many parts of the world contributed to the building of this one plant in the United States, and benefited by it.

"It is apparent," says W. J. Austin, president of the company, "that any sustained national recovery program must take into consideration the 'capital goods' industries, which normally employ about 40 per cent of the nation's industrial workers."

Recent Developments in Surface Broaching

Two Operations in which Machines of the Vertical Type Broach External Surfaces of Parts

BROACHING is becoming increasingly popular for the machining of external surfaces because of the high production rates that can be obtained, the quality of the finish, the convenience of loading and unloading the machines, and the economy of the method. Two vertical broaching machines recently built by the American Broach & Machine Co., Ann Arbor, Mich., and equipped for specific jobs are shown in Figs. 1 and 2. The machine illustrated in Fig. 1 is completely actuated hydraulically and is semi-automatic in operation, while the machine in Fig. 2 is of the mechanically operated type.

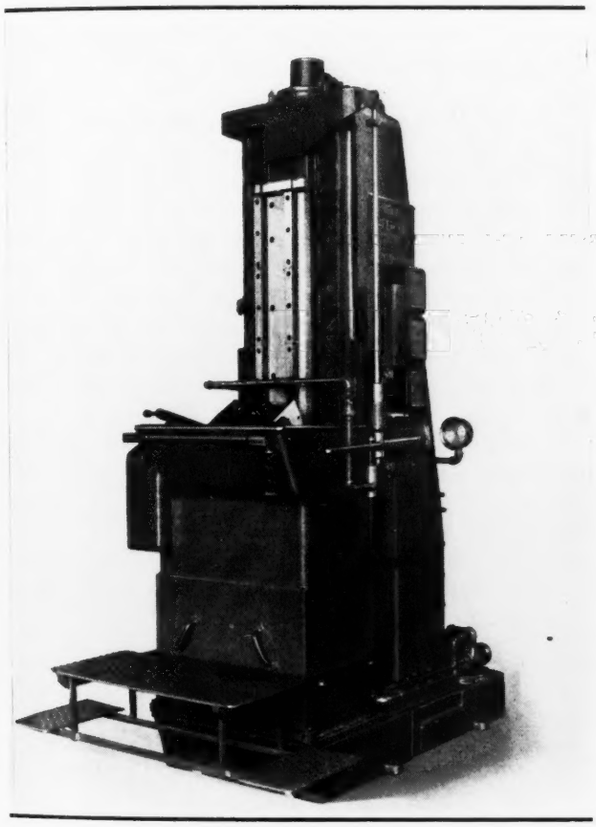


Fig. 1. Vertical Broaching Machine that is Operated Hydraulically for Finishing the Part Shown in Fig. 3

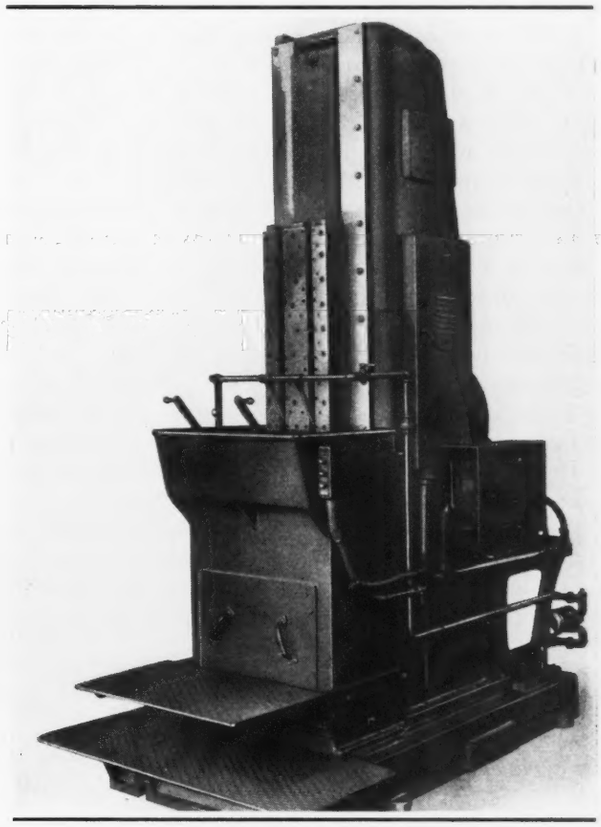


Fig. 2. Broaching Machine that Produces Flats on Shackle Pins Used in an Automobile Having no Front Axle

The machine in Fig. 1 is equipped for broaching away the stock indicated by the heavy dotted lines in Fig. 3. At the beginning of an operation, the work-holding fixture is tilted forward, as shown in Fig. 4, with two pieces of work in place for simultaneous broaching. After the operator loads the fixture, he locks the parts in place by means of a cam-lever and presses a push-button. The fixture then rocks backward and downward to center the work pieces over pilots in front of the broaches. This tilting and positioning of the fixture is accomplished hydraulically by means of a cylinder at the left-hand end of the table.

At the same time that the operator presses the button to swivel the fixture as described, he pulls a lever to start the broaches on the downward or cutting stroke. Fig. 5 shows the position of the fixture during the cutting stroke, the operation having been almost completed when the photograph was taken. When the stroke has been completed, the fixture swings upward, ready for reloading, and

while the reloading is being done, the broaches return to the starting position. The entire cycle is performed in 18 seconds, so that the time per piece is 9 seconds.

Electric controls on the right-hand side of the machine interlock the broach slide and the work fixture to guard against accidents. The operator cannot swing the fixture into the broaching position unless the broach slide is at the top of its stroke. When the broaches are raised, however, the operator can move the fixture at will by means of two push-buttons at the front of the machine. The cutting speed of this equipment is 28 feet per minute, and the return speed 50 feet per minute.

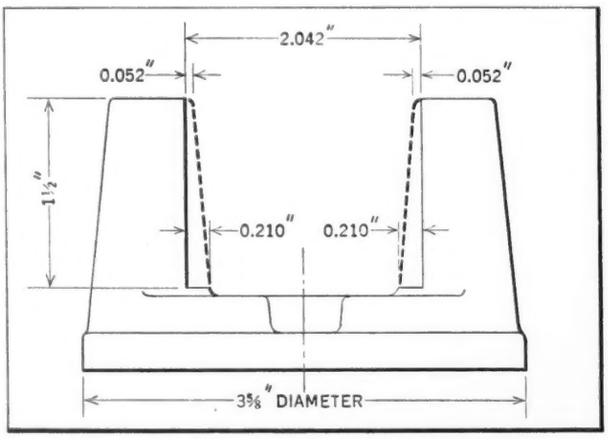


Fig. 3. The Heavy Dotted Lines Indicate the Stock that is Broached from This Part

One of the 1934 automobiles that is built without a front axle uses shackle pins of the design illustrated at *X* in Fig. 6. These pins are broached flat on the ends, as indicated by the end view, after being threaded on the central portion. The flat surfaces must be parallel within 0.001 inch for the length of the pin. Two pins, or a total of eight surfaces, are broached simultaneously, the broaches being arranged as indicated by letters *A* in view *Y* of Fig. 6. The production averages 300 pieces per hour.

The fixture used in this operation is shown in Fig. 7 dismantled from the broaching machine. Each piece of work is held by the threaded portion in jaws that are threaded to correspond. These jaws are opened and closed by operating a lever. Sufficient pressure can be exerted on the pins to prevent them from turning during the operation, and the jaws are locked in the closed position by means of a cam device. In the illustration, one of the jaw units is closed while the other is open to receive a shackle pin.

After a pin has been put in the fixture and locked in place by the movement of a lever, the jaws rock downward to bring both ends of the pin on a hardened and ground support for the broaching operation. An extending finger on one support locates the pin lengthwise. On the fixture proper, just below the hardened supports, are small holes through which lubricant is forced to wash away chips from the broach teeth. The lubricant is supplied during both the cutting and the return strokes of the ram.

In an operation, the ram stops at the end of the cutting stroke to permit removal of the work. The operator then pushes a button to move the ram back to its starting position.

The broaches used in this operation are made with the teeth at an angle. Each broach consists of three sections, one foot in length. When the finish-

Fig. 4. This Fixture Tilts up for Convenient Unloading of the Work Pieces

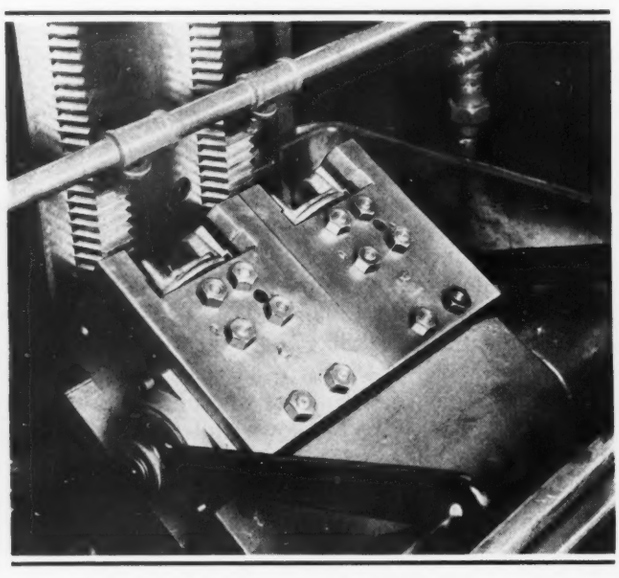
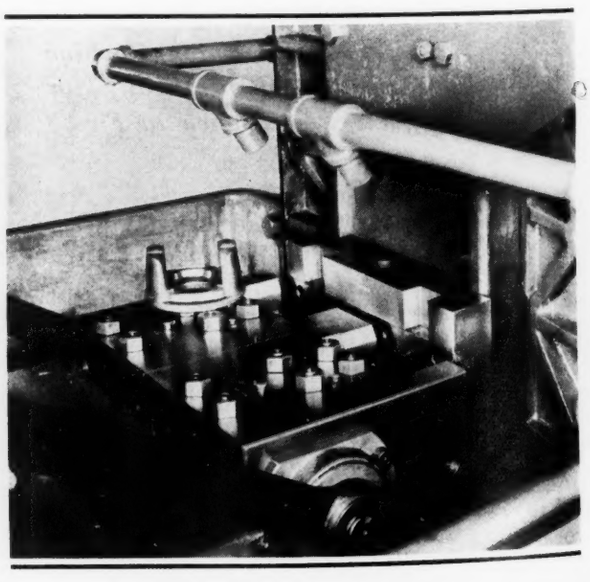


Fig. 5. Hydraulically Operated Fixture Shown in Fig. 4, in the Working Position



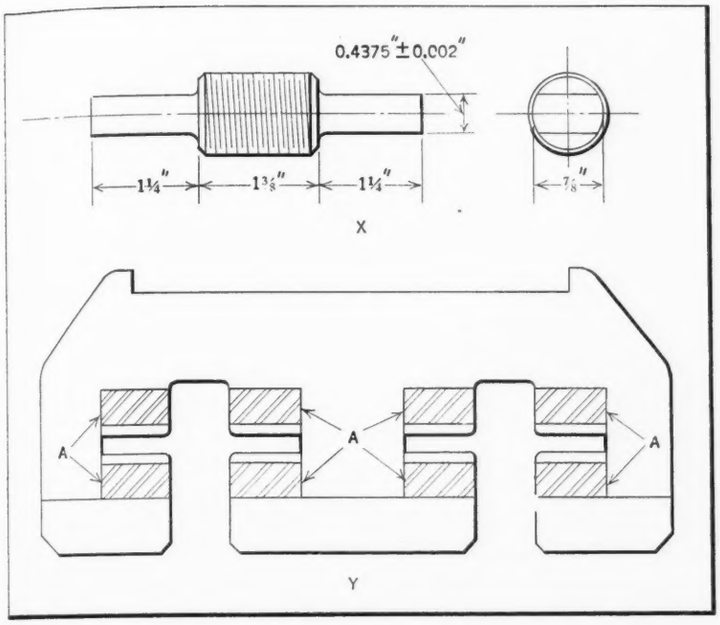


Fig. 6. Drawing of a Front Shackle Pin Used in Automobiles Built Without a Front Axle, and Diagram Showing Arrangement of Broaches that Produce the Flat Ends of the Shackle Pin

ing section of any broach becomes worn under size, it can be reground and used in the middle position, and when it becomes under size there, it can be reground for use in the first position. The broach-holder, to which the broaches are attached by screws, is heavily constructed to avoid springing.

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A Study of Stresses in Welded Joints

At the annual meeting of the American Society of Mechanical Engineers, Everett Chapman, vice-president in charge of engineering, Lukenweld, Inc., Coatesville, Pa., presented an exhaustive paper on welded joints, in which the author dealt especially with the stresses in joints produced by this process, illustrating the distribution of these stresses by stress photographs. The condition of the metal in welded joints was also dealt with in a series of photomicrographs illustrating the effect of welding, stress relief, and treatment at two critical temperatures of two pieces of steel of different carbon content. Students of the conditions surrounding the successful application of welded joints will find much of interest in this paper, which may be obtained through application to the American Society of Mechanical Engineers, 29 W. 39th St., New York City. Since the subject is not well understood in the general engineering field, this paper is a real contribution to technical literature. Mr. Chapman is one of the pioneers in the electric welding field, and his extensive experience gives added importance to this paper.

Meeting of the Taylor Society

The Taylor Society met December 6 to 8 at the Hotel Pennsylvania, New York, and at Stevens Institute of Technology, Hoboken, N. J. A special program was arranged at the Stevens Institute for the fiftieth annual celebration of Taylor's graduation, the program being arranged in cooperation with the American Society of Mechanical Engineers. In connection with this celebration, there was a metal-cutting demonstration and a one-act sketch given by the Stevens Dramatic Society entitled "The Young Man from Philadelphia."

At the meeting, papers were read and discussions presented on the NRA, scientific management in college administration, and in production, marketing, research, and control.

At the Society's annual dinner, Fred Henderson of Norwich, England, author of "The Economic Consequences of Power Production" and "Money Power and Human Life," spoke on "The Economic Consequences of Power Production."

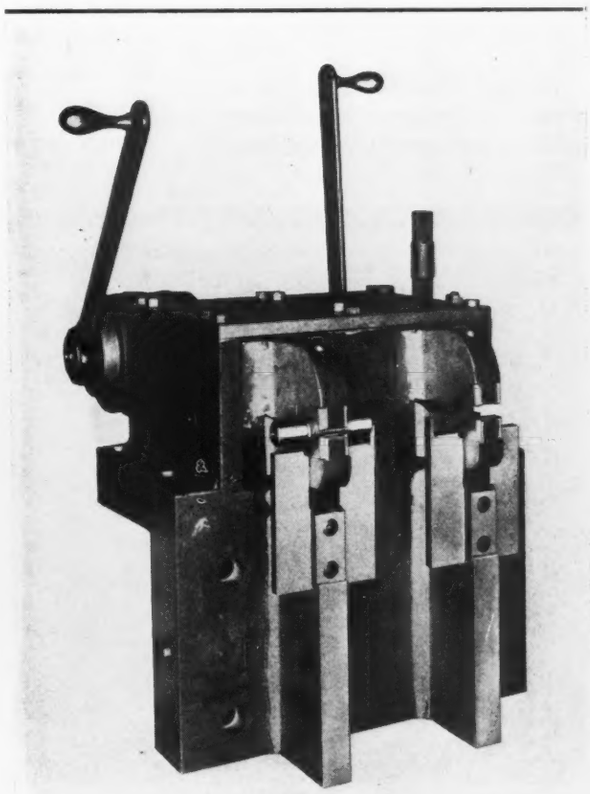


Fig. 7. The Work-holding Fixture Used in Broaching Front Shackle Pins (Shown Removed from the Broaching Machine)

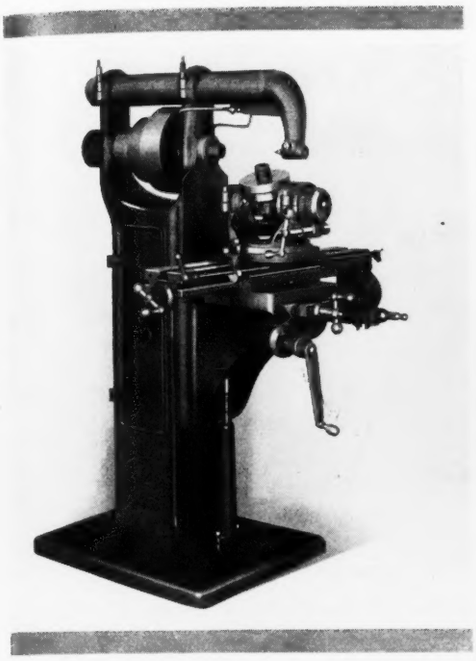
The Fiftieth Anniversary of the Cincinnati Milling Machine Co.

IT is just fifty years ago that the foundation of the Cincinnati Milling Machine Co. was laid in small rented quarters in a downtown district of Cincinnati. The company was incorporated in 1884 as the Cincinnati Screw & Tap Co., making screws and taps and doing a general jobbing business. The shop needed a milling machine, and as there were no means with which to buy one, it was decided to build it. Shortly afterward, several local firms asked to have similar machines built for them. Other orders followed, and soon the manufacture of milling machines outgrew the screw, tap, and jobbing business. The screw and tap business was therefore sold out, and in 1889, it was decided to specialize on milling machines and cutter grinders under the name of the Cincinnati Milling Machine Co.

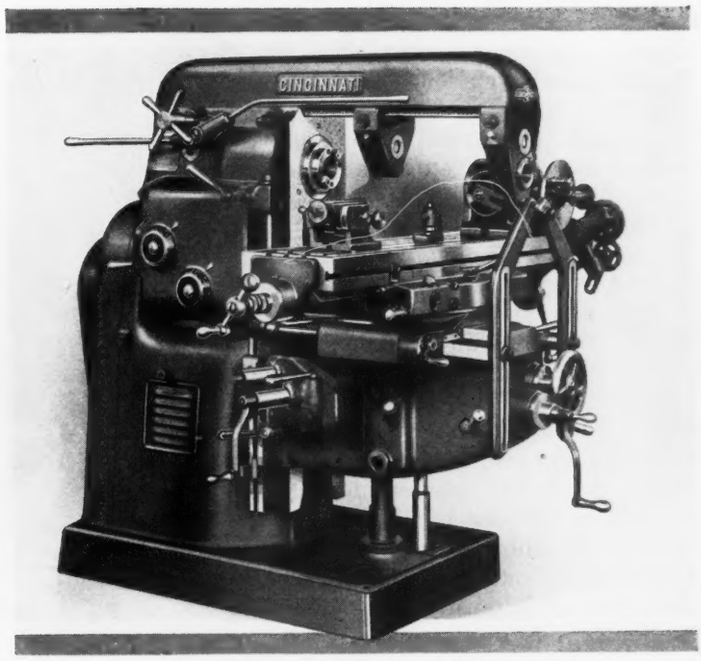
In 1887, Fred A. Geier, now president, became associated with the company and has continued ever since in its management, assisted during the period between 1900 and 1926 by C. Wood Walter. In 1916, Frederick V. Geier, now vice-president and general manager, joined forces with his father. Three brothers of Fred A. Geier have also been closely connected with the business—P. O. Geier, treasurer; Dr. Otto P. Geier, in charge of personnel; and Walter H. Geier.

(Above) The First Shop of the Cincinnati Screw & Tap Co., Later the Cincinnati Milling Machine Co. (Below) Oakley Factory Colony—at A Plant of the Cincinnati Milling Machine Co. and at B Plant of Cincinnati Grinders Incorporated

In the early nineties, the increasing volume of business necessitated the building of a new plant, located at Spring Grove Avenue and Alfred St. in Cincinnati. The export trade was being developed, and as early as 1890 the first Cincinnati milling machine went to Europe. At the Paris World's Fair in 1900, a milling machine incorporating for the first time a positive all-geared feed-change mechanism was exhibited by the company. The "high-power" millers of both the horizontal- and vertical-spindle types were designed in 1906 and 1907, and



The First Cincinnati Milling Machine, Built about 1883



One of the 1933 Cincinnati Dial Type Milling Machines

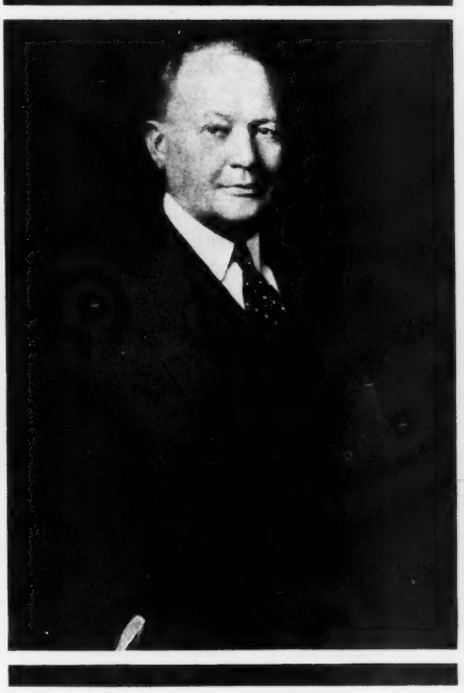
as an adjunct to these machines, "wide-spaced" cutters and face mills made from high-speed steel were developed.

For nineteen years the company remained at the Spring Grove Avenue plant, but in 1909, a new modern plant was erected at Oakley, a suburb of Cincinnati, where the company had purchased a 100-acre tract with the best of railroad facilities. In 1907, the company had built its own foundry here in order to control the quality of its castings. Several other machine tool builders erected plants in this locality, making it one of the outstanding machine tool centers of the country.

In 1912, an entirely new type of milling machine—the automatic miller—was brought out, and in 1917 larger sizes—the Nos. 4 and 5—of the high-power milling machines. Constant improvements have, of course, been made since in the entire line of milling machines. More recently the company has entered the broaching machine field with new types of machines.

In 1921, the company engaged in the manufacture of cylindrical grinding machines by acquiring the Cincinnati Grinding Machine Co., which company built various center-type grinding machines. The following year the manufacture of centerless grinders was started. The extensive development of the latter type of machine has revolutionized the grinding art in many fields, and the centerless method of grinding constitutes one of the outstanding developments in the machine tool field in recent years. Such machines are now built to grind small wire only 0.010 inch in diameter, while other machines handle parts up to 10 inches in diameter. Bars and tubes 24 feet long are also being ground by the centerless method. For the manufacture of all grinding machines, an associated company, Cincinnati Grinders Incorporated, was organized in 1926. This company also has a plant in the Oakley factory colony. Today these plants cover over seventeen acres of floor space.

As early as 1889, a cutter and tool sharpening machine was designed which has con-



Fred A. Geier, President of the Cincinnati Milling Machine Co. Mr. Geier has been Associated with the Company Since 1887

stantly been improved from time to time, the latest advanced design—the No. 2 universal cutter grinder—being brought out in 1929.

For years, good relations have been maintained between employes and the company. In 1914, the Employes Service Department was established to centralize and coordinate employe relations, employment, medical help, safety and sanitation activities, and sickness and life insurance. In 1920 an Employe Representation Plan was established through the election of an Employes Service Committee.

It is fitting to commemorate the fiftieth anniversary of this outstanding machine tool building concern by showing in the accompanying illustrations the first building in which its activities were carried on and the present extensive plant. The first milling machine, built in 1883, and the machine into which it has been developed are also shown.

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Grinding the Springs for "Knee-Action" Automobiles

Automobiles without front axles are one of the striking mechanical innovations that will be presented to the public in the automobile shows of 1934. In these "knee-action" cars, as they are termed, the front wheels are suspended from the frame by coil springs.

Fig. 1. Grinding the Front Springs for Automobiles Made Without Front Axles

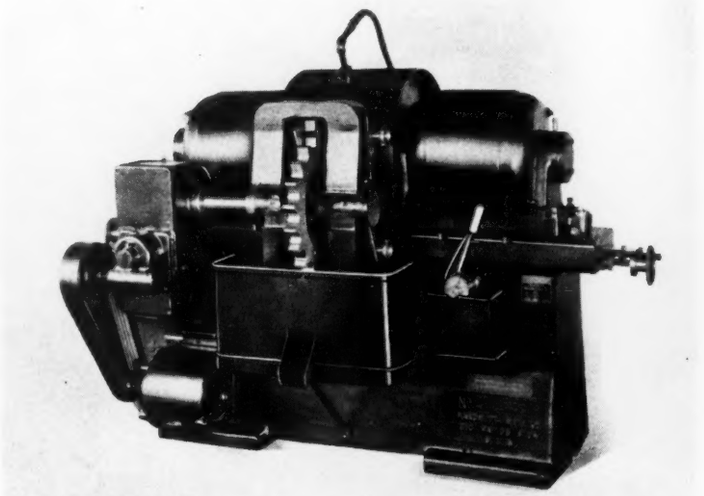

Fig. 2. Machine Designed for Grinding Both Ends of Coil Springs at a Single Pass

The Hanchett Mfg. Co., Big Rapids, Mich., has recently installed equipment of the type shown in Fig. 1 for grinding the ends of these coil springs. Fourteen automatic clamping fixtures of the V-block type are positioned around the 72-inch diameter work-table. Each of these fixtures holds two springs. When the machine is once in operation, the operator reverses every second spring as it comes to the loading point, so as to grind both ends in two passes around the machine. He replaces the finished springs between those that are reversed. Fourteen springs are thus ground completely on both ends at each revolution of the table. This equipment enables a production of 400 springs an hour to be obtained.

Approximately 1/16 inch of stock is removed from each end of the springs. Every second vee in the fixtures is provided with a hardened plug at the bottom end that is 1/16 inch higher than the corresponding plug in the adjoining vee. This difference in height compensates for the stock ground from one end during the first pass around the machine, so that the top ends of the two springs in each fixture are in the same grinding plane. Three vertical grinding heads driven by 25-horsepower motors do the grinding. The complete machine weighs 32,000 pounds.

Another type of machine designed for simultaneously grinding both ends of coil springs 2 1/4 inches in diameter by 2 inches long is shown in Fig. 2. These springs are made of 7/16-inch wire. A rotary dial with notches around the periphery carry the springs between two 24-inch grinding disks. A shoe holds the springs in the notches while they are passing the disks. Rough springs are ground on both ends at the rate of thirty a minute.

The Aims and Accomplishments of the N.R.A.

A Critical Analysis of the National Industrial Recovery Act—Its Advantages and Its Weaknesses—Abstracted from an Address before the Recent Convention of the National Machine Tool Builders' Association

By JAMES W. HOOK, President
The Geometric Tool Co., New Haven, Conn.

TO any one who examines the genesis of the National Industrial Recovery Act, it is apparent, I believe, that its framers had a few very definite objectives in mind which they hoped and believed the enforcement of the Act would accomplish. The Act, however, was drawn hastily, with little time for careful consideration of the meaning of the text between the lines or of its inferences in the light of the existing depression psychology, other new deal legislation, and social experiments in foreign lands. The results, therefore, have not been exactly those hoped for.

The original objectives, all good perhaps, have served only as a nucleus around which new objectives have grouped themselves, day by day, since the bill became law. Everybody who has a special industrial theory to propound or a grievance to redress has sought in the Recovery Act for legal support of his theories. Inferences, therefore, have been and still are being converted into objectives at a rapid rate, thus putting upon the shoulders of the Recovery Administration an increasingly difficult task.

What the outcome will be no one knows, but it is fair to assume that unless the various interests get back to fundamentals and cease fighting for special privileges under the Act, it will either fail completely or force upon all industry a very much greater control than was originally contemplated.

Interpretation of Original Intentions of Recovery Act

When the Act was drawn, it was intended to be largely permissive. The aim was to assist those industries, like the textile, coal, oil, and several others, that had been decrying the effects of unbridled competition, to obtain relief by getting a majority of their members to prepare and present a code of fair competition which, when approved by the President, would be enforceable in the courts. There was no intention of forcing an industry that had no serious problems to solve, that paid decent wages to its employes, and that maintained reasonable work schedules, to present a code. The major intentions of the Act were to put men back to work by permitting industries to enforce a "spread-the-work" principle, and to eliminate sweat-shop practices by requiring an industry so afflicted to establish a minimum wage.

Long hours and abnormally low wages were interpreted by the framers of the Act as the source and sinew of unfair competition, and means were provided to eliminate them. At the same time, the principle was established that an industry that thought it had other unfair conditions to deal with could, if a majority of the industry agreed and the President approved, include in its code effective prohibitions without running afoul of the anti-trust laws. The President was given certain powers, which he has not felt the necessity of using so far, to license industries and units of industries that continued to operate in defiance of the pleas of their competitors or of their employes. Provisions were also included to maintain the rights and autonomy of the smaller industries and to insure that no code would promote a monopoly.

How the Recovery Act was Received by Industry

When the Act was passed, these aims were quite well understood by industry and were not generally opposed. Some industrial organizations applauded it and claimed a right to share in its conception and authorship. This was because those industries had been spreading work throughout the depression and maintaining wage schedules at decent levels.

They were soon to be disillusioned, however. The Administrator of the Act, prodded no doubt by those who saw an opportunity to gain something for themselves, made it apparent that he expected industries to be codified whether a majority of their members needed it or not. He held up before industry the challenge that national recovery depended upon speedy cooperation by industry. Hence, the industries began to organize feverishly, and to write and present codes. So extensive was this effort of industry that the Recovery Administration was forced to expand at a fantastic rate. From a small nucleus late in June, it became an organization of approximately 1200 employes within sixty days.

Industry left no doubt about its willingness to cooperate. By September 1 over 800 industries had

presented codes; and late in November, approximately 1200 codes had been offered, about 125 of which had received the President's approval.

What Permanent Gains Are in Evidence as a Result of the Recovery Act?

Industries are now beginning to ask: What has been permanently gained? Admitting that enforced spreading of work under provisions of the codes already approved has succeeded in giving more jobs to many of the unemployed, has this not been accomplished largely at the expense of lowering the standard of living of many who already had jobs and through the absorption of working capital of concerns that could ill afford the loss? After seeing the figures of industry after industry that have showed a depletion of from 20 to 60 per cent in capital and surplus during the last four years, I do not wonder that these industries look askance at being urged to risk further losses for the good of a doubtful cause. Their attitude is a perfectly natural one and should not be condemned or labeled an unwarranted industrial resistance to a national policy.

I think we are all glad that industry made such a sincere effort to cooperate. Had it not done so, the onus of failure of the recovery program would certainly have fallen upon its shoulders. Out of that failure and its effect on public opinion might have come a much stronger attempt to establish an enforced industrial control. Government regulation of industry might have given way to pleas for government direction and control. Leanings toward the latter, I believe, have received recently, and will continue to receive, distinct checks, as the public mind slowly realizes and understands that whatever the forces are that have acted to retard the recovery program, they are not caused by a hold-back or passive policy on the part of industry.

The National Recovery Act has two objectives: (1) To curtail and control production, and (2) to distribute the national income more evenly. Any effort in which the Government engages to improve the distribution of income will be approved and even applauded by all thoughtful people; but the accomplishment of this objective must not hamper the creation of the income itself. How is it possible to help matters by more equitably spreading the national income, on the one hand, and curtailing production, which is the source of all income, on the other? We must get away from this fallacy.

The Over-Production Theory and where it is Leading

Many of those who pose as students of the new order of things blame the ills of the present on over-production. Because of an unjust distribution of the national income, they say, those who received the lion's share invested in additional producing capacity. The result was over-production, which caused people to be dropped from payrolls and the restriction of purchasing power. This, in turn, tended still further to curtail consumption and payrolls. Thus continued the spiral until production slumped to that barely necessary to produce the necessities of life. The movement, they assert, can be stopped only by curtailing production and increasing purchasing power of the masses by the method of spreading work, raising prices, and distributing mobile wealth among the unemployed.

Launching the attack from that quarter, the Agricultural Adjustment Administrator, under authority of one of the sixteen acts passed last spring, began to offer rewards to farmers who would agree to curtail production. The money used was to be taken from the public at large in the form of processing taxes, which is a means of spreading national income or wealth by taking from one and giving to another. The National Recovery Administrator, under authority of another of the sixteen acts, set about to spread industrial income among more workers by shortening hours and taking a larger share of the income from employers by all but forcing them to pay increased wages.

He also undertook to curtail industrial production in the future by permitting, and, at the beginning at least, encouraging codes to outlaw expansion of producing capacity. The Relief, Public Works, and Mortgage Refunding Acts would effectively spread a large block of the mobile wealth of the nation, and currency inflation, if it comes, will act to the same purpose by taking away from creditors and giving to debtors.

Can the Objectives be Reached by the Present Course?

Thus we can see all these acts working in unison to accomplish two fundamental results—first, to curtail and control production, and second, to more evenly distribute the national income or its corollary—national wealth. To aid in the accomplishment of these two objectives, we see further evidence of a trend toward government control in the acts concerning banking and sales of securities, public utilities, coordination of transportation, and the resolution that repealed the gold clauses in all existing contracts. Altogether, it is expected that the attainment of these two objectives will increase

consumption and that this will be followed quickly by an increase in production and a demand for more men and women to man the productive processes.

My observations have led me to believe that much can be said for one of these objectives and much against the other. The object of the most orthodox of economic systems is to make it possible for every person to obtain a share of the national income sufficient to enable him to live in reasonable ease and comfort. No thoughtful person will say that the national income has been distributed with equality in the past. Any effort, therefore, in which the government engages to improve that distribution, *so long as it does not hamper the creation of income itself*, will be approved and even applauded. But how it would be possible to help matters by more equitably spreading the national income, on the one hand, and curtailing production, *which is the source of all income*, on the other, is entirely beyond me. Yet that is the plain inference of the two objectives of the "New Deal" legislation.

If it is true that the principal objective of all economic systems is to spread the national income equitably, while keeping the total of that income at the maximum, then what happens when production is curtailed? Obviously, a decrease in national income. How then can we increase the standard of living of our people if we curtail the production of things that go to make up that standard? The answer is, we can't. Production is the very foundation of our economic life. It is purchasing power. It is the basis of credit. It is wealth itself.

The Danger of Hard and Fast Rules Concerning Working Hours

The National Industrial Recovery Act would attempt not only to shorten hours—an objective good in itself—but also to establish a maximum number of hours which any unit of industry may work its employes. This arbitrary setting of the maximum working week, in my opinion, is the most sinister and dangerous single feature of the entire Act. It presupposes that idle labor can be called to new tasks at will and that it will remain efficiently on the job until an over-supply of orders are executed, whether it takes twenty-four hours or six weeks, or any other period.

I declare that such a supposition is fallacious. When a business is subjected to a fixed working week beyond which it cannot work its employes, it will find itself effectively strangled the minute its volume of orders over-reaches the maximum output of its equipment. For, when that time comes, it cannot hold up orders until it has enough business on hand to employ a second shift, neither can it afford to install added machinery for the purpose of executing a limited over-supply of business. The only way in which it can solve such a problem, barring refusal to accept more business, is to work its existing forces beyond the maximum week.

How much better it would have been had the Act called for the establishment of a normal week in various industries beyond which they could not work without paying penalty wages. The latter may have been time-and-a-quarter for the first step, time-and-a-half for the second, and so on up to double time, when inordinately long hours were required. Such a procedure would have made the Act self-enforcing. Employes would demand the extra pay for over-time work and employers would be encouraged to use all reasonable measures to get along without working over-time. Under the requirements of the Act as at present written, maximum hours must be established. By hard fighting and by agreement to pay over-time wages, most industries have been able to establish the right in their codes to work a few extra hours during each six months' period.

> ***If it is true that the principal objective of all acceptable economic systems is to equitably spread the national income while keeping the total of that income at the maximum, then what happens when production is curtailed? Obviously there is a decrease in the national income. There is less to be distributed. There is a reduction in the standard of living. How can anyone imagine that we can increase the standard of living in the United States if we curtail the production of things that go to make up that standard? The answer is, we cannot. Production is the very foundation of civilized life.***

Are We Headed for Greater Governmental Direction of Industry?

I have always objected to a super-planning board empowered to force its will upon American industry. I have never felt that such a board of supermen could be found in this country, or in any country, who would be wise enough, or endowed with mental capacity great enough, to master the enormous detail of American business and finance sufficiently to direct its mass movements toward a certain goal. Since June, however, I have felt the ship listing in that direction, and with others, have given much thought to the kind of super-board I should like best, if it becomes apparent that one must come.

My suggestion for selecting the members of such a board would be by vote of the members of the code authorities of all codified industries. These

men are likely to be not only the leaders of those industries, but also the ones in whom the members have implicit confidence; men before whom they would be willing to lay the vital statistics of their businesses. When five hundred codes have been approved by the President, the members of all these code authorities should be invited to form an association. This association should then select from its membership a council of one hundred, who, in turn, would select the industrial members of the super-board. By waiting until five hundred codes had been approved, there would be assurance that the small industries would not be dominated by the large.

The association formed should not be tied to the apron strings of any existing organization. It should not be made heir to the traditional differences and animosities that are present in nearly all established organizations or to the jealousies that exist between them. And above all, it must be representative of the codified industries, and not cluttered up with a conglomerate membership of local Chambers of Commerce and Manufacturers' Associations, whose responsibilities are not definite and whose interests, in large measure, are centered in other fields.

Thus my plea is that the set-up shall insure that the voice of small industry and small units of industry shall certainly be heard in the councils of any super-planning board that might be brought into being. The industrial philosophy of this nation emanates from the smaller units of industry.

Obviously, a super-planning board, if it is created, will not be constituted wholly of members from industry. Three other groups will claim the right of supplying members as well. The first of these is labor, the second government, and the third the consumer.

Industry Must Continue to Cooperate with the Administration

My closing plea is that we continue to cooperate with the administrators of the Act to the very best of our abilities. Much of the Act is good. It has done more to eliminate child labor and sweatshop practices than all the acts that have been placed on the statute books during the last quarter of a century. It has caused a very great spreading of work and, on the whole, has increased payrolls; and whether or not we believe that such of those benefits as could be credited to the Act produced an actual increase in purchasing power, it is fair to give them the benefit of the doubt. The fact remains that many more are on the payrolls today than a year ago and that industrial production has markedly increased in the meantime. These accomplishments are most desirable, any way you look at them.

Let us not forget, either, that the administrators would welcome suggestions from industry as to what it thinks that the future of the Act should be—whether it should be broadened or contracted, or whether it should be left unaltered or repealed entirely.

Works Councils in American Industry

According to a report by the National Industrial Conference Board, the works council form of employe representation in industry has developed rapidly during recent years. In 1919, there were 196 factories with 403,765 employes operating under the works-council plan; in 1932, there were 767 plants with 1,263,194 employes under the works council system. In 1932, the total membership of the American Federation of Labor was 2,532,261, of which not more than half were employed in factories and mines. Thus, the membership of factory employes in works councils equalled the union membership in the industries.

Under the works-council plan of employe representation in industry, representatives of both employers and employes of a factory meet together to confer on complaints, wages, working conditions, pensions, and other questions of mutual interest.

As an example of the working of the plan, it may be mentioned that more than 6000 complaints of workers at the plants of the Bethlehem Steel Co. have been arbitrated peacefully during the fifteen years that the works council has been in existence in these plants. Under the Bethlehem plan one delegate is elected for each two hundred workers to sit in the council which meets regularly with representatives of the management.

Of the 6000 complaints handled, two-thirds were decided in favor of the employes, 13 per cent were settled by compromise, 6 per cent were withdrawn, and only 14 per cent were decided in favor of the company. About one-half of the cases before the council have dealt with working conditions and wage rates.

The Bethlehem works council has administered the pension and relief funds. Last year $1,171,049 was paid out for relief work. The council was also instrumental in bringing about a plan by which 20,000 men have been retained on the payrolls of the company during the depression, instead of laying off these men and working a smaller force full time.

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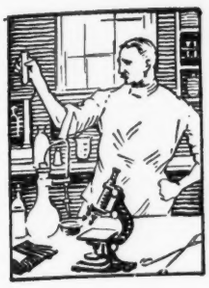
Personal opinions are inconstant and variable; fundamental principles are constant and invariable.
—*Robert Scudder Denham*

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Bronze Castings Now Made for Every Requirement

Bronze castings have been produced for years at the East Chicago, Ind., plant of the Superheater Co., 60 E. 42nd St., New York City, for that concern's own use and for local manufacturers. Because of increased demands, the company has now extended its plant and laboratory facilities to provide a much broader service under the direction of the Bronze Foundry Division.

Bronze castings, rough or finished, can be supplied in three classes of mixtures. These mixtures include standard bronzes, aluminum bronzes, and a super-tensile manganese bronze. "Elesco" is the trade name of these bronzes.

Various grades are specifically recommended by the company for bushings, gears, acid-resisting parts, valves, forming and drawing dies, pump parts, and many other articles. Bushings and bars are carried in stock in a large range of sizes.

Aluminum Reduces the Non-Profit Paying Loads of Trucks

The gross weight of a loaded motor truck consists of the dead weight of the truck itself plus the pay load that it carries. In a booklet recently published by the Aluminum Co. of America, Pittsburgh, Pa., it is pointed out that the profits in motor truck operation grow proportionately as the dead weight is reduced and the pay load increased. This can be accomplished through the extensive use of aluminum alloys in truck construction.

Trucks with aluminum bodies of different styles have been built for the transportation of gasoline, fuel oil, milk, coal, and food products, as well as for the long or short hauling of general merchandise. The cost of fabricating commercial truck bodies of aluminum is about the same as for other metals. While the material cost is somewhat higher, it is claimed that the savings resulting from the use of aluminum more than offset the higher first cost.

Aluminum alloys have also been applied recently in chassis construction. Through the partial use of aluminum, the weight of one truck chassis was reduced as much as 2900 pounds, and this did not represent the maximum weight reduction that could have been obtained. The sub-frame, fifth wheel, fenders, hubs, brake spiders, and spring hangers are a few chassis parts suitable for manufacture from aluminum alloys.

Phenolic Plastic Sheets Pressed with Stainless-Steel Plates

Plates that possess high resistance to corrosion are required in pressing sheets of phenolic plastics and such other composition products as plaster board. This property is necessary because of the chemical compounds and pulp used in the manufacture of the products. The smooth, highly polished plates are laid between the composition sheets.

Copper plates have been widely used for this service in the past, but they are easily marked and have to be constantly repolished. To avoid this, copper plates have been chromium-plated. This has increased their serviceability, but there is still the drawback of a soft base. Chromium-plated steel plates have also been used, but difficulty has been experienced in making the plate adhere.

The Republic Steel Corporation, Central Alloy Division, Massillon, Ohio, has supplied plates of Enduro stainless steel for this exacting service. These plates are almost completely corrosion-resistant and need polishing at infrequent intervals only. Their inherent hardness enables them to withstand readily the high pressures to which they are subjected, as well as the rigors of handling.

A High-Strength Copper Alloy with Unusual Conductivity

Much has been said about the lost art of hardening copper as practiced by the ancients. In recent times, similar methods have been rediscovered, but all of them—both ancient and modern—have involved the use of alloying elements that have reduced the electrical and thermal conductivity of the metal.

However, a new group of copper-base alloys known as "Cupalloy" has recently been developed, the electrical conductivity of which approaches that of pure copper, although the alloys are much harder than pure copper and possess a much greater elastic strength. The creep strength of these alloys is considerably greater than that of cold-drawn copper, and the strength does not deteriorate with time at elevated temperatures. Commutators, slip rings, and other parts of electrical apparatus can be manufactured advantageously from this alloy.

The Colors of the Rainbow are Now Rivalled by Bakelite

The deep red of the ruby, the sparkling blue of the sapphire, and the brilliant green of the emerald have been captured in a new line of transparent resinoids, produced after years of research by the Bakelite Corporation, 247 Park Ave., New York City. These colorful resinoids are intended to bring a touch of beauty to many utilitarian things and to permit the inexpensive production of many articles for personal adornment. Buckles, cigarette holders, pipe bits, beads, earrings, and bracelets are a few of the objects for which this new product is being used.

Seamless Pipe and Tubing Made by The Diescher Process

A Diescher mill for the production of seamless pipe and tubing was placed in operation this year by the Babcock & Wilcox Tube Co., Beaver Falls, Pa. An important advantage of this process is that even the small tube sizes, which ordinarily require cold-drawing, can be hot-finished. Unusually close tolerances can be maintained, and a remarkably smooth, scratch-free inside finish is obtained.

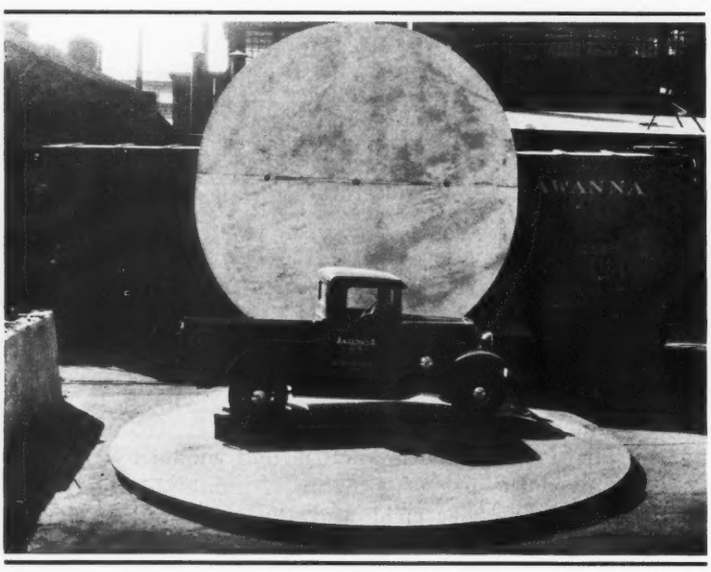
One of the manufacturing steps that is of unusual interest is performed by a machine known as the "Elongator." This machine takes the pierced "round" or "hollow" as it comes from the piercing mill, establishes its diameter, and reduces the wall thickness to the desired dimension. This operation, of course, lengthens the hollow to form the tube.

The elongating operation replaces the usual rolling and reeling performed by the conventional automatic mill. It is said to permit close control of the wall thickness and concentricity and of the interior finish. If necessary, the diameter of the tube can be reduced still more by running it through a "sinking" mill.

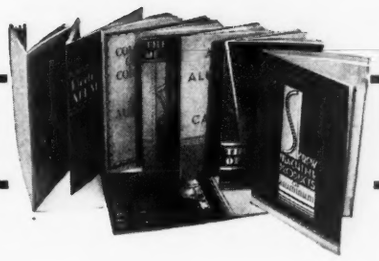
Cast Crankshafts—a Feature of the New Ford

Rumors concerning the use of cast crankshafts in automobiles have been current for more than a year. Now, according to published reports, the Ford Motor Car Co., has made the cast crankshaft a part of regular automobile practice. The metal of which the crankshafts used in the new Ford cars are made is said to be a cast-alloy high-carbon steel with a high copper, chromium, and silicon content. The minimum elastic limit in torsion of this metal is said to equal that of the forged steel formerly used in Ford crankshafts.

Other advantages claimed for the new material are much longer life under alternating stresses such as are present in an engine crankshaft; better bearing properties than those of ordinary crankshaft steel; and self-lubricating properties, due to the graphite content of the cast metal, through which wear on the journals is said to be greatly reduced. It is stated that tests have shown that after 10,000 miles of car operation, the wear on the new cast crankshaft is less than 0.0001 inch. With forged-steel crankshafts there was always a measurable wear after about 10,000 miles of car operation. It is also stated that there is less wear in the bearings.



These four Muntz metal half-circles are the largest non-ferrous plates ever rolled. They were supplied for condenser-head plates to the Westinghouse Electric & Mfg. Co. by the Detroit plant of the American Brass Co. Each half-circle is 1 1/4 inches thick and measures 126 by 236 inches. The total weight of the four plates is 37,532 pounds.

NEW TRADE  LITERATURE

Any of these Publications can be Obtained by Writing to the Manufacturer or to MACHINERY. Send for Your Copy Today.

Grinding Machines

NORTON CO., Worcester, Mass. Catalogue illustrating and describing Norton Type C motor-driven cylindrical grinding machines of 10-inch swing, a new line of machines especially designed for cylindrical grinding operations where extreme accuracy, finishing ability, and maximum production are demanded.

Catalogue descriptive of the Norton 6- by 18-inch hydraulic surface grinding machine with automatic cross-feed, which has been developed to meet the demand for a small surface grinder having all the features of modern high quality machines.

Catalogue illustrating and describing the Norton No. 1 universal tool and cutter grinding machine, which has been designed with a view to obtaining economy, strength, simplicity, flexibility, convenience, and easy operation.

Bulletin descriptive of the Norton Type C semi-automatic grinding machine—a specialized, highly productive, and easily operated plunge-cut cylindrical grinder.

Circular describing a new automatic electric sizing device known as the "Nortonizer," which is applicable to any new Norton cylindrical grinding machine, as well as to the Type A and Type BA power-traverse or hand-traverse machines.

Bulletin outlining the features of construction of the new Norton hydraulic double-head crankpin grinder.

Circular describing the features of construction and the operation of the Norton Cam-O-Matic, a hydraulically operated machine designed to grind all the cams on a camshaft automatically.

Grinding Machines and Heads

HEALD MACHINE CO., Worcester, Mass. Bulletin 7089, illustrating and describing the Heald No. 81 internal grinding machine, which has been designed to meet the demand for an automatic internal grinding machine for small work. This catalogue is an outstanding example of typographical art. The photography is particularly striking, most artistic effects being obtained from entirely unretouched photographs.

Catalogue on Heald "Red Head" grinding-wheel heads for use on Heald internal grinding machines. The new features of design and construction are pointed out, and the various styles are illustrated. The catalogue lists the types and sizes of grinding heads most desirable for certain size holes, so that the user can choose the head best adapted for the work to be done.

Aluminum Truck Bodies

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa. Booklet entitled "Alcoa Aluminum for Truck Bodies," containing information on the design and manufacture of aluminum truck bodies, covering the mechanical properties of Alcoa aluminum alloys, general truck body design, and shop practices relative to the fabrication of aluminum bodies. In connection with the suggested designs of various types of truck bodies, construction drawings are given, printed on paper suitable for blueprinting. Recommended painting procedure for aluminum bodies is included. Case histories based on many operators' records show the savings effected by the use of this metal. The information given should be of considerable value to designers and builders of truck bodies.

Lubricators

VICTOR LUBRICATOR CO., 3900 N. Rockwell St., Chicago, Ill. Bulletin containing an article on the fundamentals of lubrication, by J. C. Peebles, Professor of Lubrication at the Armour Institute of Technology. The article discusses the principles of lubrication, bearing design, and oil supply. In connection with this pamphlet, the company is distributing a bulletin illustrating different types of Victor automatic lubricators.

Truck and Caster Wheels

METZGAR CO., INC., Grand Rapids, Mich. Catalogue 31, containing data on the Metzgar end-wood wheel, a wheel especially designed to obtain long-wearing and easy-running qualities. Fourteen points of superiority of these wheels are outlined and a variety of applications are illustrated. Information is included on how to select the correct wheel and bearing and how Metzgar wheels are installed.

Flexible Couplings

LINK-BELT CO., 910 S. Michigan Ave., Chicago, Ill. Catalogue on flexible shaft couplings, tabulating three different types, with special emphasis on the Type RC which employs Link-Belt Silverlink roller chain for connecting the toothed halves of the coupling. Prices are included. The selection of the right coupling for the work is made easy by a series of conveniently arranged tables.

Seamless Pipe and Tubing

BABCOCK & WILCOX TUBE CO., Beaver Falls, Pa. Bulletin T-7, entitled "B & W Diescherized Pipe and Tubing," outlining the important facts relating to the Diescher process, by means of which tubes having a scratch-free inside finish and a uniform wall thickness are produced. Applications for which this pipe and tubing are especially adapted are pointed out.

Taper Pins

WORCESTER TAPER PIN CO., 47 Lagrange St., Worcester, Mass. Circular containing tables of weights and prices of Worcester taper pins, as well as drill sizes for these pins; a table of prices for threaded taper pins, with nuts assembled; and data on depth stops for taper-pin reamers.

Swaging Machines

TORRINGTON CO., 55 Field St., Torrington, Conn. Catalogue discussing the art of swaging, and illustrating

various sizes of the Dayton-Torrington swaging machine. The features of construction and the operation of these machines are described, and the dimensions and capacities of the different sizes are given. A repair part list is included.

Corrosion-Resisting Iron Pipe

REPUBLIC STEEL CORPORATION, Youngstown, Ohio. Catalogue (Form ADV 220-B) entitled "Toncan Iron Pipe for Permanence," containing sixty-four pages of information on corrosion-resisting iron pipe. Part 1 is given over to technical data and describes tests made under various conditions. Part 2 shows a variety of installations and gives service records.

Electric Motors

LOUIS ALLIS CO., Milwaukee, Wis., is publishing a magazine known as *The Louis Allis Messenger*, intended especially for those interested in the purchase and maintenance of electric motors. It contains articles on interesting new motor developments and applications, as well as valuable data on the care and operation of electric motors.

Alundum Polishing Grain

NORTON CO., Worcester, Mass. Booklet entitled "Research—and Alundum Polishing Grain," outlining the technical aspect of polishing grain as determined by tests in the Norton laboratories. The data covers the function of polishing grain; angularity or grain shape; adhesion—bonding strength; and controlled sizing.

Speed Reducers

FALK CORPORATION, Milwaukee, Wis. Bulletin 270, describing the features of design of Falk Motoreducers and showing typical installations in various classes of service. Specifications for the different sizes are given, as well as selection tables to assist the user in choosing the right equipment for the required service.

Steel Castings

SIVYER STEEL CASTING CO., Milwaukee, Wis., is issuing a publication known as *Ladle Sparks*, containing articles relating to steel castings. The second number contains an article entitled "Specifications for Steel Castings," and shows various typical applications of castings made from Sivyer alloy steels.

Portable Compressors

WORTHINGTON PUMP & MACHINERY CORPORATION, Harrison, N. J. Bulletins illustrating and describing Worthington portable compressors with 310 cubic feet and 360 cubic feet displacement, respectively. The bulletins show many of the mountings available for these compressors.

Presses

BAIRD MACHINE CO., Bridgeport, Conn. Loose-leaf circular illustrating and describing Baird automatic multiple transfer presses, which are designed for the quantity production of articles made from wire or ribbon metal that require multiple operations.

Shop Trucks

MERCURY MFG. CO., 4118 S. Halsted St., Chicago, Ill. Bulletin 160, entitled "The Modern Materials-handling System," illustrating and describing the Banty gas tractor and the Mercury trackless train for materials handling in shop transportation.

Silent Gears

SPAULDING FIBRE CO., INC., Tonawanda, N. Y. Bulletin containing engineering and design information on gears cut from Spauldite, a laminated phenolic material. Tables of horsepower ratings ranging from 1 to 50 diametral pitch are included.

Skin Protection Cream

MAGNUS CHEMICAL CO., INC., Garwood, N. J. Circular describing the Magnus "Skin-Gard," a creamy preparation intended for machine shop use for protecting the hands against infections, cracks, abrasions, grease, and dirt.

Chaser-Grinding Machines

GEOMETRIC TOOL CO., New Haven, Conn. Bulletin entitled "For Longer Lasting Chasers," illustrating and describing the No. 10 chaser grinder and the Geometric Style E universal chaser-grinding fixture.

Cold-Drawn Steel Products

UNION DRAWN STEEL CO., Massillon, Ohio. Folder entitled "Steel Bars—Tested 100 Per Cent," describing the commercial application of magnetic testing in the production of cold-drawn steel bars.

Pumps

ROOTS-CONNERSVILLE-WILBRAHAM, Connersville, Ind. Bulletin 260-B11, descriptive of the RCW Type T turbine pumps, which are designed to handle comparatively small quantities of liquids at high pressures.

Thread-Cutting Tools

GEOMETRIC TOOL CO., New Haven, Conn. Loose-leaf circular descriptive of the Geometric Class SL collapsing tap for tapping small holes, the outstanding feature of which is the sturdy, rigidly supported chasers with which it is equipped.

Material-Handling Equipment

CLEVELAND TRAMRAIL DIVISION OF THE CLEVELAND CRANE & ENGINEERING CO., Wickliffe, Ohio. Circular outlining the original basic principle of the Cleveland overhead tramrail system, and illustrating a variety of applications.

Arc-Welding Equipment

HOBART BROS. CO., Troy, Ohio. Bulletin D-7, on the arc-welding of copper to copper and copper to steel, containing detailed instructions for applying the Hobart newly developed "Long Arc" method of welding.

Blast Cleaning Equipment

PANGBORN CORPORATION, Hagerstown, Md. Circular illustrating and describing blast room equipment, including abrasive separators, safety helmets, blast room doors, and steel abrasives.

Heat-Treating Furnaces

PARKER-KALON CORPORATION, 200 Varick St., New York City. Catalogue descriptive of the Hyro automatic furnace for cyanide hardening and heat-treating by other liquid bath processes.

Recording Instruments

BROWN INSTRUMENT CO., Philadelphia, Pa. Folder entitled "15% Fuel Saving Between These 2 Lines," illustrating and briefly describing the Brown recording CO_2 meter.

Electric Motors

LOUIS ALLIS CO., 427 E. Stewart St., Milwaukee, Wis. Chart showing twenty-nine types of electric motors and listing the proper motor for over fifty different applications.

Welding Equipment

LINCOLN ELECTRIC CO., Cleveland, Ohio. Application Sheet No. 36 in a series on the elements of design, describing the design of wheels of welded construction.

Shop Equipment News

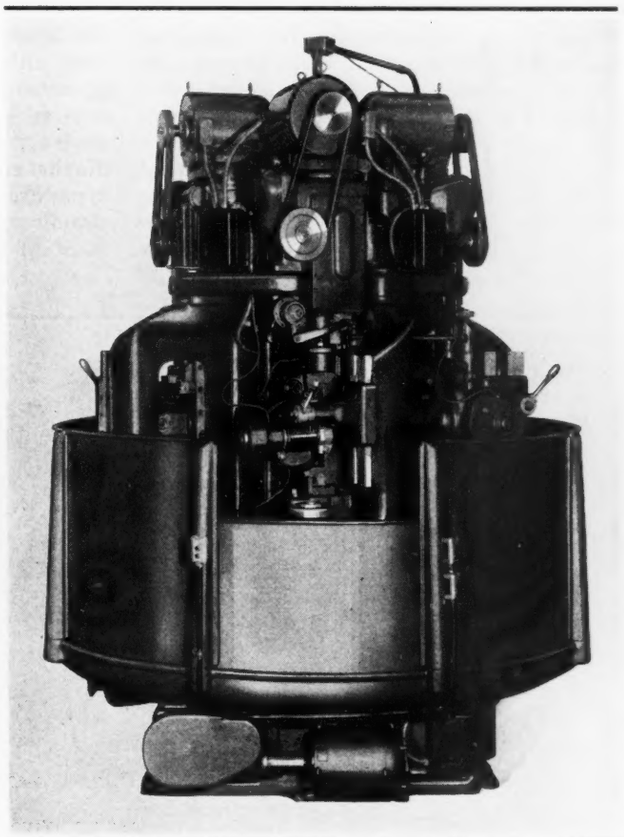
Machine Tools, Unit Mechanisms, Machine Parts and Material-Handling Appliances Recently Placed on the Market

Lees-Bradner Heavy-Duty Rotary Hobbing Machine

The second of a series of gear-hobbing machines recently developed by the Lees-Bradner Co., Cleveland, Ohio, is shown in the illustration. This is a heavy-duty rotary type of machine adapted to hobbing spline shafts, worm-wheels, and spur or helical gears. Right- or left-hand helical gears with spiral angles up to 45 degrees can be produced. Gears up to 7 inches outside diameter and up to 9 inches face width can be accommodated. Teeth up to 4 diametral pitch can be cut in steel.

One of the features of this machine is that each hobbing unit functions independently of the others. If the rotation of the table on which the hobbing units are mounted is stopped, the units will complete their cycles of operation and come to a stop with the hob slide returned to its starting position before the power is automatically cut off.

Four, six, or eight hobbing units can be supplied, each provided with an individual three-horsepower constant-speed motor drive. The hob feed and speed changes are independent. The rotating table is actuated by a separate two-horsepower, constant-speed motor through worm-gearing. The rotation of the table can be timed through pick-off gears from one revolution per minute to one revolution in sixteen minutes. An exclusive feature of this machine is that it is impossible to start the rotation of the table without first starting the lubricant and coolant pumps. This arrangement safeguards both the work and the machine from damage due to lack of lubrication.



Lees-Bradner High-production Hobbing Machine of Rotary Design

Another important feature is that several different jobs can be handled simultaneously because of the flexibility of the hobbing units. When one job requires more time than another, a unit can be set to pass twice around the machine, so as to allow enough time to complete the operation while the other units are producing two pieces.

The machine is fully automatic. Power is supplied through a circular collector at the top. The driving motors for the separate hobbing units are controlled automatically by travel limit switches which start each motor after the unit passes the loading position and stop the motor when the cycle of operations is completed and before the unit reaches the loading point again. When the machine is running, the operator merely loads and unloads the work-spindles. Two push-buttons control the starting and stopping of the machine. One starts the rotation of the table, while the other starts the pump motor and stops both this motor and the table rotation.

Filtered oil is pumped to a receptacle at the top of the machine for lu-

bricating purposes. The oil flows by gravity to the various bearings and gear-boxes and then back to a reservoir in the base. Cutter coolant is pumped to a separate reservoir at the top of the machine, whence it flows by gravity through flexible hose to the cutters. Both pumps are driven by means of a one-horsepower motor.

The work-spindle of the hobbing units has a No. 14 Brown & Sharpe taper hole. It is driven through a hardened and ground worm and accurate index-gears. Floating anti-friction bearing mountings are provided on both the work-spindle and the hob-spindle to allow for expansion. The tail-block is raised, lowered, and locked by moving a lever in one plane only.

The rotating table, which carries both the hobbing units and the driving mechanism, is mounted on a substantial base. The entire active weight is supported on a large Timken roller bearing which has a rated capacity of 50 tons. The outside diameter of the base for the four-spindle machine is 8 feet 3 inches, and for the six- and eight-spindle machines, 9 feet 4 inches. The over-all height of all three sizes of machines is 115 inches.

Mercury Pallet-Handling Tilting-Fork Truck

The latest addition to the line of electric- and gas-powered lift trucks made by the Mercury Mfg. Co., 4118 S. Halsted St., Chicago, Ill., is of the design here illustrated. This truck, which is known as the Type T.T.T., is constructed for handling low pallets. As in the Mercury platform lift trucks, the fork is elevated by means of a motor-driven gear pump which actuates a hydraulic ram. Large-diameter sheaves on the ram operate double lifting cables. The fork is tilted by two double-acting hydraulic cylinders, actuated by the same oil-pump. However, they are controlled by a valve independently of the lifting action.

The truck illustrated has a carrying capacity of 3000 pounds. It may be provided with forks of suitable length, width, and thickness for the loads to be handled. The fork can be tilted 15 degrees forward and 2 1/2 degrees backward. The maximum lifting height is 109 inches. This type of truck will be available in a complete range of models, including tilting and non-tilting, non-lift, high-lift, and telescopic high-lift models. The capacities range from 2500 to 4000 pounds.

Heald Improved Internal Grinder for Small Parts

Changes recently made in the design of the No. 81 internal grinder built by the Heald Machine Co., Worcester, Mass., improve its flexibility and increase the ease of handling. This machine is intended primarily for the grinding of small parts, as was pointed out in the article published in May, 1932, MACHINERY, page 704, at the time that the machine was originally placed on the market. A separate motor drive for the work-head has been adopted as standard, to facilitate grinding either straight or tapered work. The motor is mounted on the work-head, as shown in Fig. 1, and drives the spindle through a belt. An adjustable idler takes up slack. A single- or two-speed alternating-current motor or a single- or adjustable-speed direct-current motor can be furnished.

The fixture-operating mechanism is similar to the original design, although it is hydraulically operated. As before, it is available in a standard pull type, a push type, and a special type for diaphragm fixtures. All three types are actuated by a small hydraulic cylinder mounted on the back of the work-head, which

Mercury Hydraulically Operated Lift Truck Designed for Handling Low Pallets

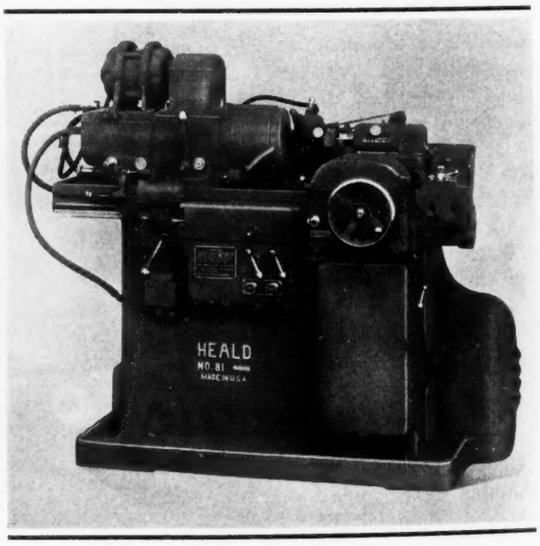


Fig. 1. Heald Internal Grinder Improved in Design to Increase the Flexibility and Ease of Handling

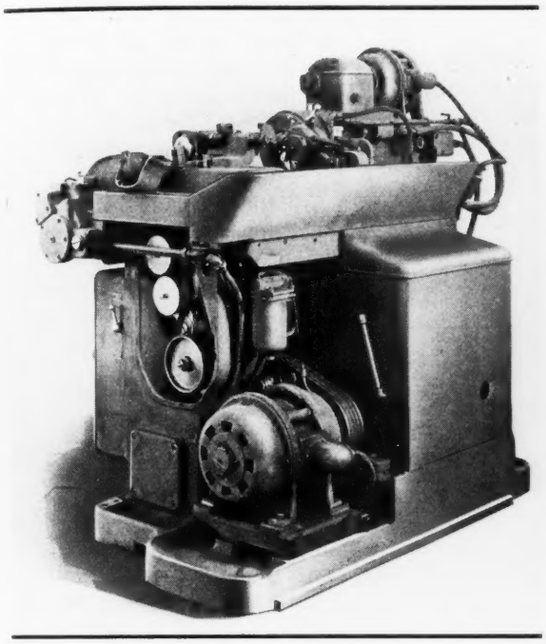


Fig. 2. Rear View of Internal Grinder, Showing the Drive to the Wheel-head

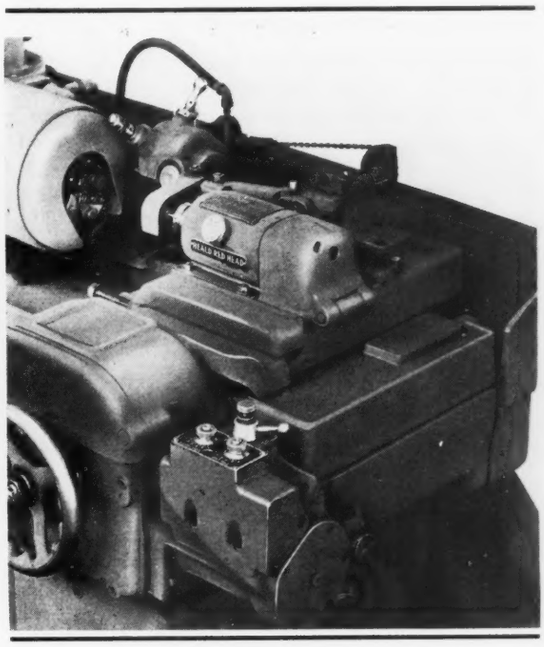


Fig. 3. Graduated Knobs Give Complete Control of All Feeds

bears against a lever on the fixture-operating shaft. A valve for controlling the operation of the fixture is mounted on the front of the machine at the left of the control box. A squared shaft projects from the front of the work-head, where the operating lever was formerly located, so that the fixture can be operated manually when the motor is not running. The work-head clutch is now actuated by a hydraulic cylinder controlled by the table.

A swinging drain pipe has been added to the standard water tank for ease in emptying the tank when necessary. An extra-capacity tank has been designed to take the place of the standard tank on high-production jobs, in order to eliminate heating of the water. This tank rests on the floor at the left-hand end of the machine and is so constructed that it does not increase the required floor space. When the extra-capacity tank is supplied, a guard takes the place of the standard tank.

The drive from the motor to the wheel-head idler shaft is delivered through multiple V-belts, as shown in Fig. 2, while the drive to the wheel-head is by means of the extra-flexible woven belt used in the past. The base of the machine has been made larger and heavier to give improved stability under extreme operating conditions.

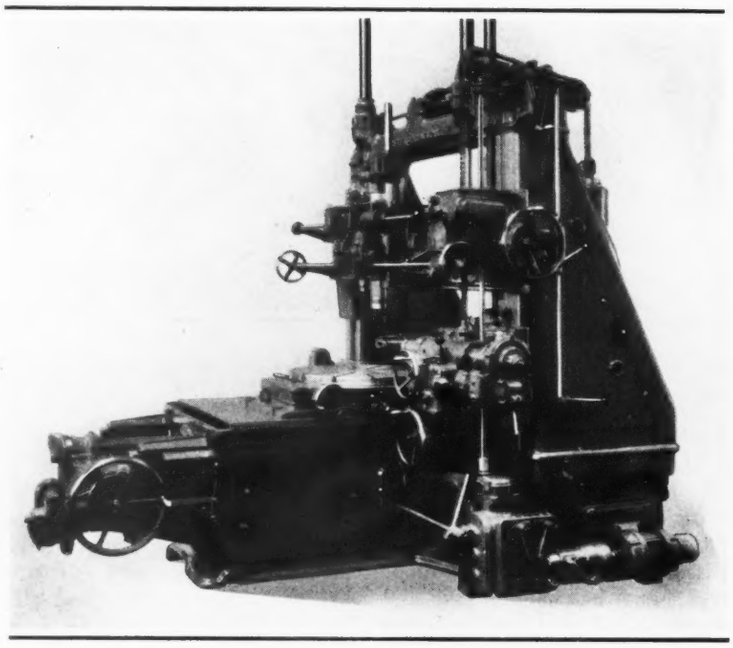
The machine controls have been changed only in detail, although a hand-knob has been added for regulating the spring tension on the gages. A taper adjustment is provided for the work-head through opposed screws which work on the same principle as on the No. 72A Gagematic. The housing for the electrical equipment has been increased in size to provide room for two magnetic switches and a hand-operated line switch. When alternating and direct current are used on the same machine, or if for some other reason all of the electrical equipment cannot be housed in the standard box, an extra box is mounted on the base below the work-head.

The cross-feed mechanism is actuated entirely by hydraulic pressure independently of the table reciprocation. With this arrangement, the right table speed and the right wheel feed can be obtained without one being dependent on the other. Four feed adjustments are available, although six distinct functions are performed by the cross-slide during the grinding cycle. These include a pick-up feed as the wheel enters the hole, and a roughing feed that is set for as many passes of the wheel as are needed before it drops to a fine feed. As the wheel withdraws for truing, all feed is stopped. When the hole approaches the finish size, practically all the feed is cut off and a spark-out feed is obtained. Finally, as the wheel withdraws from the hole, it is backed off ready for a new piece of work. When an extremely high finish is not necessary, the spark-out feed can be eliminated to speed up production without reducing the accuracy of the hole. In Fig. 3 may be seen the graduated knobs which give the operator complete control of all feeds.

Constant working pressure is maintained at the feed valves, irrespective of changes in the line pressure, by a reducing valve provided for the purpose.

Swiss Jig Borer of Large Capacity

Holes can be drilled and bored in the sides, as well as in the top, of jigs and similar parts, by the large sized jig boring machine here illustrated. Four machines of this design have recently been built for the Russian government by the Societe Genevoise d'Instruments de Physique, Geneva, Switzerland, and one for the French government. The machine has been designated as Model MP-6B. It is being introduced in the United States and Canada by the R. Y. Ferner Co., Investment Bldg., Washington, D. C.



Large-capacity Jig Borer which is Equipped with Two Vertical Heads and a Horizontal Head

The vertical boring heads are similar to those of the No. 6 machine which has been on the market for several years. The main spindle has a No. 4 Morse taper and a feed of 10 inches, while the high-speed spindle has a No. 2 Morse taper and a feed of 4 inches. Nine speeds are available for the main spindle, ranging from 48 to 420 revolutions per minute, while the high-speed spindle range is from 140 to 1250 revolutions per minute. Three rates of power feed are available for each spindle.

The horizontal boring head is mounted on the right-hand column of the machine. It operates at the same speeds and power feeds as the vertical main spindle, but has a feed of 12 inches. The vertical lead-screw of the horizontal head is equipped with a micrometer and vernier reading to 0.00005 inch and a compensating templet for automatically correcting small errors in the screw. The construction is the same as on all of the jig borers made by this concern. The drilling capacity of both large spindles is 2 inches in cast iron, while the boring capacity is 6 inches with a single-point tool.

All three boring heads are in the same vertical plane. The distance between the two vertical spindles is exactly 8 inches, so that it is a simple matter to machine large vertical holes with the main spindle and smaller ones with the high-speed spindle, an allowance of 8 inches in the readings being all that is necessary in changing from one spindle to the other. Holes on the same horizontal axis can be bored simultaneously through the use of a bearing provided for the outer end of the boring-bar. This bearing is lined up with the boring head by an optical device of great accuracy. The use of the horizontal spindle is further extended by the circular table. Holes can be bored horizontally around a part by merely revolving this table to the proper setting.

Some of the important specifications of this machine are as follows: Diameter of circular table, 31 1/2 inches; free space between columns, 55 inches; maximum distance between table and nose of vertical spindles, 36 1/2 inches; length of table travel, 52 inches; and transverse movement of vertical heads, 40 inches.

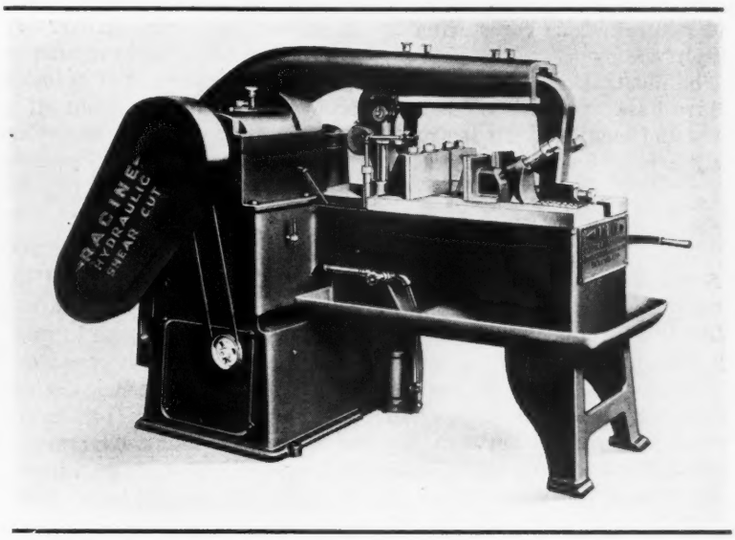
Racine Improved Hydraulic Shear-Cut Production Saws

Three hydraulic shear-cut production saws recently shipped to Vatican City by the Racine Tool & Machine Co., Racine, Wis., embody a number of improvements over the model described in May, 1931, MACHINERY, page 719. The saw guide and saw frame of the improved machines, one of which is illustrated, slide in ways that extend on each side of the frame. Thus the frame is well supported on both sides instead of on the top only. Adjustment is provided by two gibs on each lower bearing surface and one side gib.

The connection between the saw guide and the main hydraulic cylinder is through two tension rods on each side of the frame. These extend down through the table and are attached to the piston-rod by a cross-member. The construction is such that the hydraulic feeding pressure is applied directly under the center of the blade.

The saw frame is of a new design, having ways that are bolted entirely through the frame on each side. This makes it possible to exert a heavy tension on the saw blade, and at the same time, prevents any distortion of the frame due to this tension from affecting the accuracy or alignment of the side plates. This is a valuable improvement over the one-piece frame construction that was formerly used. The hydraulic pumping unit now runs in oil in the reservoir. The volume of the pump, as well as the pressure, is controlled by an automatic governor.

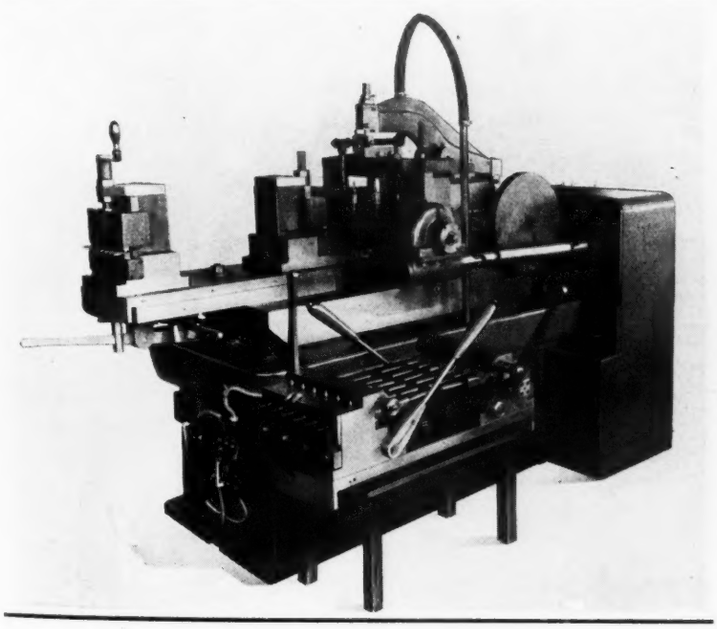
The various improvements that have been made in these saws permit the use of heavy feeds with greater accuracy than before, and have thus increased the cutting speed about 10 per cent. The machines are manufactured in a larger range of sizes, as follows: 10 by 10 inches, 12 by 12 inches, 10 by 16 inches, and in special sizes of 13 by 13 inches and 13 by 16 inches.



Racine Hydraulic Shear-Cut Saw which Embodies Important Changes in Design

Producto-Matic for Short-Cut Milling

A No. 35 Producto-Matic milling machine designed especially to take care of a wide variety of milling operations of the "short-cut" type is the latest development of the Producto Machine Co., Bridgeport, Conn. Simple set-ups adapt the machine for handling small quantities of work. The general design follows that of the standard machines built by the concern. It is possible to traverse the cutter-spindle bearing vertically and horizontally, and a combination of these movements permits milling at any angle or combination of angles, and to any radius.



Producto-Matic Designed for a Wide Variety of Short-cut Milling Operations

The cabinet base provides a housing for the motor, a coolant reservoir, and a chip chamber. At the rear of the machine is a welded-steel housing which encloses a new type of transmission for driving the cutters and traversing the slide. This transmission consists of V-type pulleys and belts which give a quiet, powerful drive. Nine changes of feeds and speeds are available. The cutter speeds range from 42 to 600 revolutions per minute, while the feed camshaft rotates at speeds of from 9 to 65 seconds per revolution.

The machine is equipped with a fixture base designed to receive any number of interchangeable work-holding devices. It is intended that the fixtures be mounted 180 degrees apart on this base, as illustrated, so as to permit one station to be in the loading position while parts at the other end of the fixture base are being milled. The fixture base is hand-indexed, clamping

and locating studs registering it properly.

The illustration shows a work-fixture base mounted on the machine and another lying in front. They are obviously designed for handling different parts. As equipped, the machine has a horizontal movement of 5 inches and a vertical movement of 2 inches. The machine, with one fixture, weighs about 6000 pounds.

Mattison Internal Tube Grinder

A machine has recently been developed by the Mattison Machine Works, Rockford, Ill., for the internal grinding of tubes and pipes, in which a flexible abrasive-coated belt travels around pulleys and through the tube at high speed. Rolls support the tube and also revolve it during the grinding process. At the beginning of the operation, the abrasive belt is threaded through the tube and made endless by applying a special splicing tape. The splice is quick-setting, so that the belt is ready for immediate use. When the operation has been finished, the splice can be released for removing the belt from the tube. It can then be reset in the next tube.

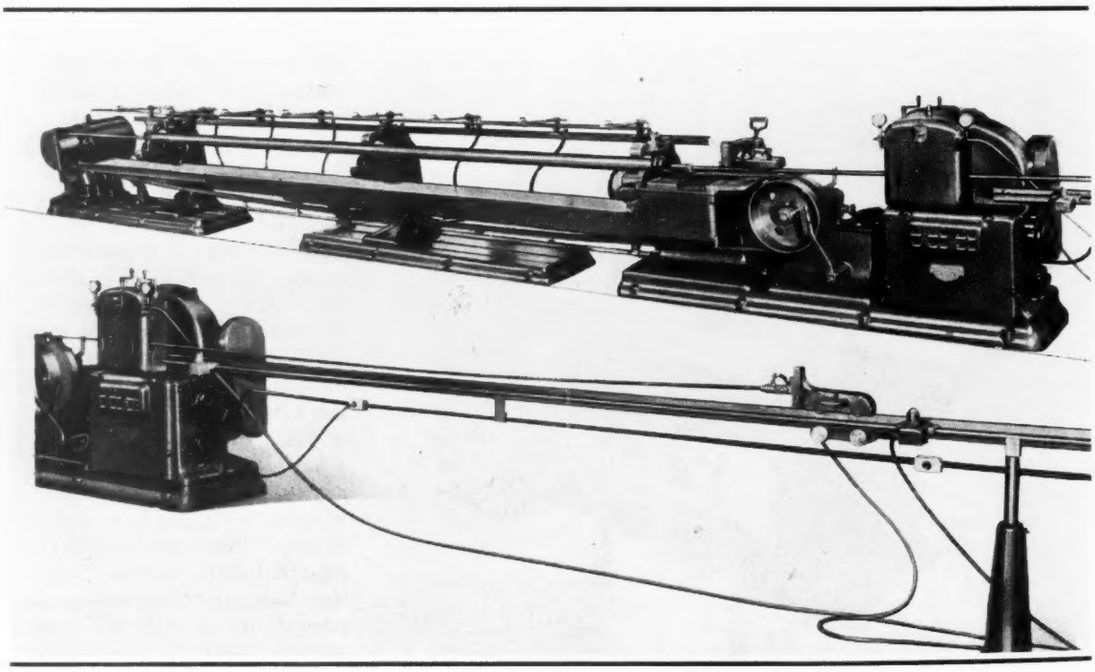
Grinding pressure is obtained by means of an expansible pneumatic head which is attached to a hollow ramrod, as seen in the upper view of the illustration. Compressed air is passed through this rod to expand the head and cause it to exert the desired pressure against the belt. The pressure is regulated by means of a control valve. The ramrod is power-driven in both directions and is automatically reversed so that it reciprocates the grinding head forward and backward through the tube. A water spray cools the tube to permit fast cutting.

Flexibility is a feature of this machine because it is possible to obtain any desired belt speed, various rates of tube rotation, various rates of grinding head traverse, different grinding pressures, etc. The finish obtained depends upon the grade of abrasive grit used. Since the cut is in the longitudinal direction, no cross scratches are produced on the work.

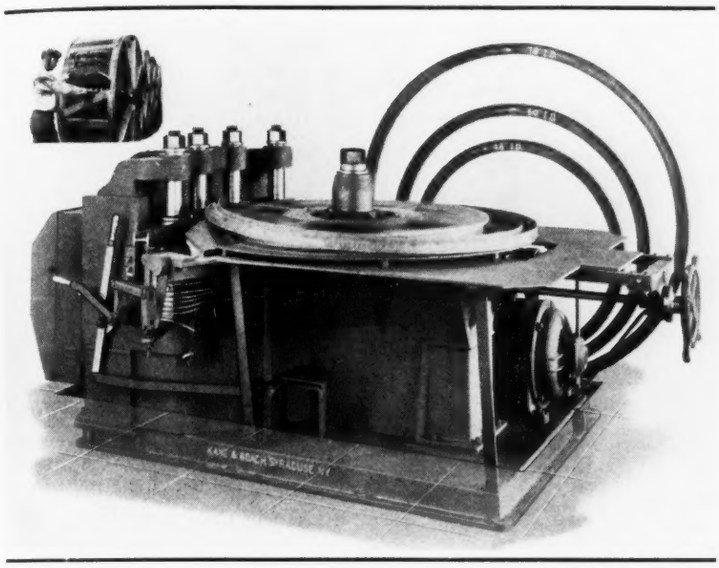
This machine can be supplied in sizes for handling tubes from 1/2 inch inside diameter upward and of practically any length. The quick-setting splicing tape and the abrasive-coated belts were developed by the Minneapolis Mining & Mfg. Co., St. Paul, Minn.

Kane & Roach I-Beam Bending Machine

A wrapping type of roll designed for bending I-beams used as rims on large reels for electric cables has recently been built by Kane & Roach, Inc., Syracuse, N. Y. The practical application of these rims will be apparent from the small view shown in the upper left-hand corner of the illustration. Three-inch I-beams weighing 5.7, 6.5, and 7.5 pounds per foot of length are bent by this equipment into rings from 48 to 78 inches inside diameter.



Two Views of a Machine that Grinds Tubes Internally by Employing an Abrasive Belt and Reciprocating Head



Machine for Bending 3-inch I-beams into Large Circles

An important feature is that the stock is bent to practically a true circle all the way to the ends, thus eliminating waste. The machine is driven by a 30-horsepower motor and bends at the rate of about 45 lineal feet per minute. Electrical and hand controls are provided.

Electrode for Welding Cast Iron

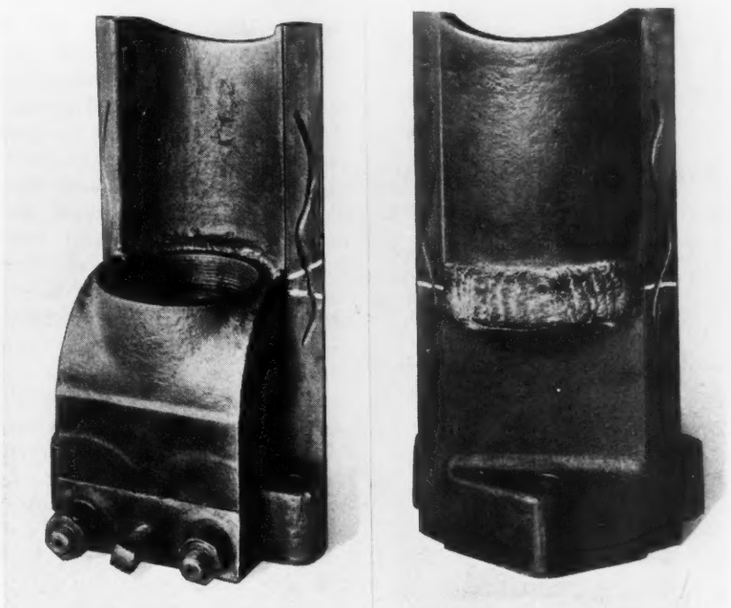
An electrode for welding cast iron by the shielded arc process is being introduced on the market by the Lincoln Electric Co., Cleveland, Ohio. This electrode, which is known as "Ferroweld" not only simplifies welding procedure on cast iron, but produces a weld of greater strength and ductility than the cast iron itself. "Ferroweld" has a steel core surrounded by a heavy flux coating that protects the arc from gases in the atmosphere that are injurious to the weld. One of the advantages claimed for the new electrode is that it can be used with a remarkably low heat, thus reducing the possibility of cracking. The electrode is manufactured in the 1/8-inch size only for use with approximately 80 amperes of electrical current.

In using this electrode, the welding is done intermittently, a bead of not more than 3 inches being laid at one time. As each bead is welded, it is peened lightly, thoroughly cleaned, and allowed to cool somewhat before the next bead is deposited. Owing to the low current with which it is used, the hardening that ordinarily takes place along the line of fusion is materially reduced. For this reason, the weld is more machineable than most cast-iron welds.

The illustrations show a weld made on a punch-press ram with "Ferroweld" electrode. The ram is about 22 inches wide and approximately 1 1/2 inches thick at the point where it was broken. The press to which this ram belongs is used for punching holes as large as 7 inches in diameter in No. 10 gage steel. The ram was broken in operation at the point indicated by the chalk marks.

"Kant-Rust," a Graphite Lubricant

"Kant-Rust" is the name of a lubricating, penetrating, and rust-preventing graphite lubricant that has been used for years in the automotive field. It has recently been improved and made practical for industrial use. This lubricant has been added to the line of the Ideal Commutator Dresser Co., Sycamore, Ill., and is available in eight different containers ranging in size from a three-ounce can to a 55-gallon drum.

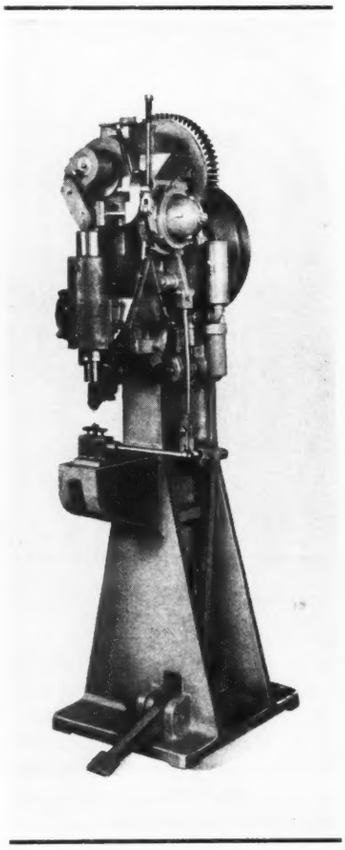


Cast-iron Press Ram Welded with "Ferroweld" at the Point Marked with Chalk

Norin Hydro-Mechanical Squeeze Riveter

A mechanical squeeze riveter arranged for automatically feeding the rivets is a recent development of the Norin Engineering Co., 355 N. Union Park Court, Chicago, Ill. The rivets are fed from a hopper to a pair of fingers mounted around the upper die, which is fastened to the plunger. These fingers hold the rivet in position under the upper die during the down or riveting stroke. A pin protrudes above the lower die surface for locating the work correctly before riveting. This pin is pushed down by the rivet to a predetermined height, in which position it forms part of the lower die.

A work-closing arrangement is also provided that insures closeness of the parts to be riveted before the actual riveting takes place. The riveter mechanism is of the hydro-mechanical type. Complete flexibility is a feature; even though the plunger is locked in its upper position, the crank can be rotated continuously without injury or overloading any part. A long, uniform-pressure stroke allows rivets to be driven into different thicknesses of material without any change in the dies or adjustments. The pressure may be adjusted. Solid iron rivets up to 3/16 inch diameter can be squeezed.

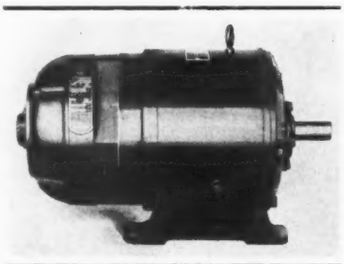


Norin Squeeze Riveter with Automatic Hopper Feed

Fairbanks Gear Motors and Splash-Proof Motors

Gear motors capable of providing speeds of from 2 to 4000 revolutions per minute are being introduced to the trade by Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill., in a complete range of sizes from 3/4 to 75 horsepower. There are three different types to meet various applications, including the integral gear motor illustrated, an all-motor type gear motor, and a gear-head type. Variations in speed are obtained by simple gear trains of single, double, or triple reduction. These gear units permit the use of high-speed motors.

The same concern has brought out splash-proof motors designed for use in breweries, dairies, bottling plants, meat packing establishments, etc. These motors are made with heavy solid cast frames and with cast end bells that are solid, except for a fan-shaped air duct with openings at the bottom just below the level of the motor feet. The air ducts are provided with removable perforated baffles which prevent water from splashing into the air duct and yet provide unobstructed ventilation for the motor. Cooling air is drawn through the motor by a fan on the pulley end.



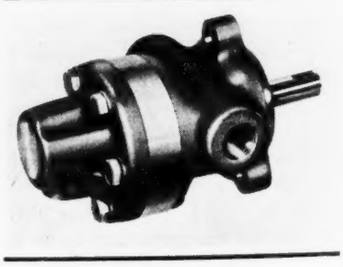
Fairbanks-Morse Integral Gear Motor

Sundstrand Hydraulic Pump

Water, oil, and other liquids can be pumped at high pressures by a small-capacity rotary pump with positive displacement that has just been added to the line of Rota-Roll pumps made by the Sundstrand Machine Tool Co., Rockford, Ill. The pumping members comprise a rotor and roller which revolve with each other in a manner similar to a single roller rolling with the outer race of a roller bearing. The principle of construction is similar to that of the pump described in May, 1933, MACHINERY. It is claimed to insure long life with extremely low power consumption.

All of the revolving parts are mounted in roller or needle bearings, with a view to increasing the mechanical efficiency. High volumetric efficiency is obtained, due to the fact that the pumping members are self-emptying and the mechanism is designed so there is little chance for slippage.

A hub and flange can be provided for flange-mounting or a foot for foot-mounting. The pump is built to run at motor speeds. Two sizes are available at present, having capacities of 1 and 2 gallons per minute, respectively, at 1725 revolutions per minute. Pumps of larger displacement will be made later.



Rota-Roll Small-capacity High-pressure Pump

Involute Checking Machine

A universal involute checking device with which no master forms or master base-circle disks are required has been developed by the Michigan Tool Co., 7171 Six Mile Road, East, Detroit, Mich. Other important features of this equipment are that readings can be made with unusual rapidity and that charting for comparison with other checking devices is readily accomplished.

This machine, which is shown in the illustration, employs a sine bar similar to those used on other equipment made by the concern. The sine bar, in this case, compensates for the difference between the length of a one-degree arc on the friction disk that originates all of the machine movements and the length of a one-degree arc on the base circle of the gear.

Machine Developed by the Michigan Tool Co. for Checking the Involute of Gear Teeth

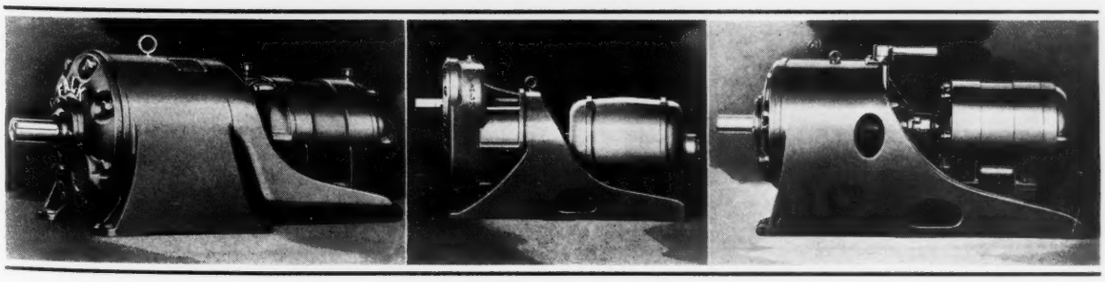
The friction disk is integral with the work-holding spindle. It imparts movement to the sine-bar carriage. Each degree of work rotation is shown on a scale beside the sine-bar carriage. The angular setting of the sine bar controls the movement of the indicator head. This head is mounted on balls resting in V-grooves and is counterweighted to hold it against the sine bar. The indicator head moves at right angles to the movement of the sine-bar carriage, so that the smaller the gear being checked in comparison to the friction disk, the smaller the angular setting required on the sine bar.

By using two indicators and a reversible indicator finger, both sides of a gear tooth can be checked without dismounting or turning the gear upside down or otherwise changing the set-up.

Additions to Falk "Motoreducers"

Three recent additions to the extensive line of "Motoreducers" manufactured by the Falk Corporation, Milwaukee, Wis., are shown in the accompanying illustration. The all-motor Type Z, shown at the left, differs from the Type U, described in MACHINERY, October, 1932, page 156, in that the ledge that supports the motor, instead of being integral with the gear housing, is in the form of a separate adapter which is rigidly fastened to the housing. This construction is especially useful with large gear reductions when the motor is relatively smaller than the gear-case. It allows the utmost freedom in the choice of a motor, so that the buyer can use a standard horizontal motor from stock without any change whatever being necessary.

The all-motor Type LU reducer, shown in the middle of the illustration, combines the essential features of the geared-head reducer described in April, 1933, MACHINERY, page 552, with those of the all-motor Type U. It is a single reduction unit. A standard horizontal motor with feet can be employed, the motor being mounted on a ledge-shaped casting to which the gear-case is rigidly attached.



Three of Five Types Recently Added to the Line of "Motoreducers" Built by the Falk Corporation

The general design of the gearing is the same as in the geared-head type, except that two bearings are provided for the high-speed shaft and the high-speed oil seal is modified. The high-speed shaft is connected to the motor shaft through a Falk resilient coupling. The take-off shaft may be located above or to either side of the motor shaft. When totally enclosed or explosion-proof motors and a speed reduction of 9 to 1 or less, or a speed increase up to 2.3 to 1 are required, this type reducer can be used without modification.

At the right-hand end of the illustration is shown a two-speed "Motoreducer," equipped with helical gears and anti-friction bearings throughout. The Type U housing is used without change, thus affording interchangeability of single- and two-speed types of reducers. Both the speed range and the speed reduction are contained in a single housing, and only in rare cases is a further speed reduction necessary at the low-speed end.

The Falk Corporation has also developed Types DUX and RUX vertical reducers, which embody the same basic features as the horizontal types. Also, speed reducers in which the high-speed and low-speed shafts are in a straight line and which are designed for direct connection to separately mounted, off-standard motors, have been brought out by the company. The straight-line reducers are known as Types DS and RS.

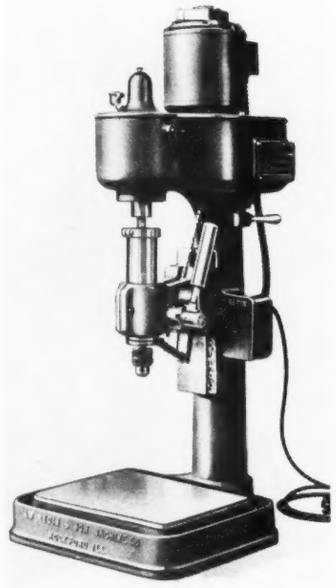


Fig. 1. Drilling Machine with Rolling-wedge Transmission

Redin Sensitive Drilling Machine

The special feature of a sensitive drilling machine recently designed by the A. W. Redin & Son Machine Co., 1846 Eighteenth Ave., Rockford, Ill., is a rolling-wedge transmission that provides four speeds. From Fig. 2 it will be seen that this transmission consists of a motor pulley, a spindle cone pulley, and a non-metallic idler that is held against the two pulleys by a light spring. Owing to the direction of rotation, the idler becomes automatically wedged between the two pulleys whenever resistance is applied to the spindle. Tests have shown that it is impossible to stop the spindle without first stalling the motor.

Shifting from one speed to another is quickly accomplished by pushing a lever to the rear and then up or down. The shift comb, located on the outside of the machine just above this lever, makes shifting fool-proof. Speeds can be changed with the motor running. A brake handle located on the outside of the transmission housing eliminates the necessity of grabbing a revolving chuck to stop the machine quickly.

A Howell capacitor-type electric motor is supplied as standard equipment. Precision ball bearings are used throughout the spindle assembly. From two to eight spindle heads can be assembled at 9 1/2-inch centers on a ground base for production drilling.

Planigressive Multi-Speed Reducers

A multi-speed reducer has just been added to the Planigressive line of speed reducers manufactured by the Davis & Thompson Co., 6619 W. Mitchell St., Milwaukee, Wis., and distributed by the Planigressive Reducer Sales Co. of the same city. This device gives both a variation in speed and a speed reduction. It makes possible the use of a constant-

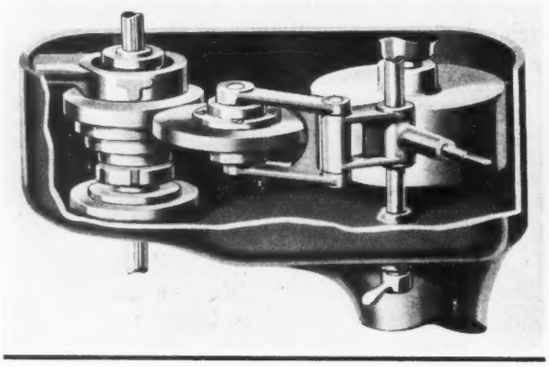
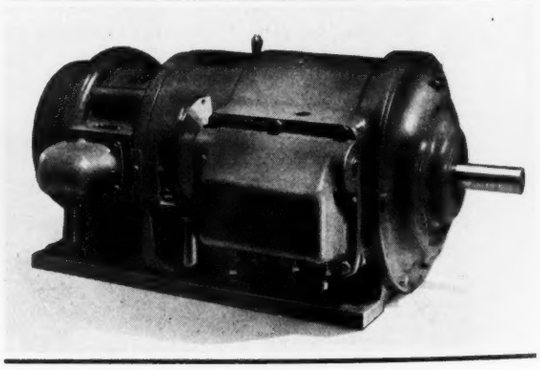


Fig. 2. Rolling-wedge Transmission which Provides Four Drilling Speeds



Planigressive Multi-speed Reducer Driven by a Constant-speed Motor

speed motor instead of a motor of the multi-speed type, and gives the exact speed required.

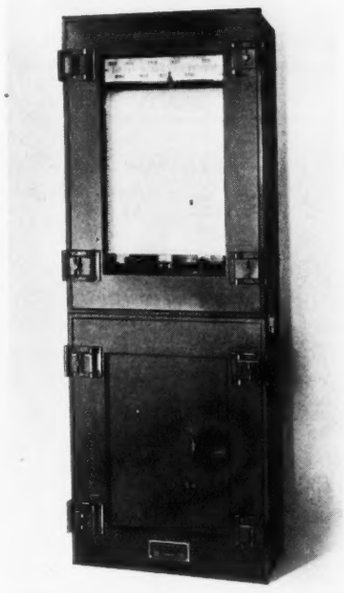
The reduction in speed is obtained through planetary gears, composition gears being used to insure quiet operation. All that is necessary for changing the speed is to shift a lever. Speed changes can be made while the reducer is running with or without a load, and with the reducer stopped. The reducer can be run in either direction.

This multi-speed reducer can be obtained in sizes from 3/4 to 10 horsepower. Practically any combination of ratios from 3 to 1 up to 7 to 1 can be supplied. In conjunction with other reductions, a wide speed range is available, and reductions up to 600 to 1 or higher.

Speedomax Recorders

Any quantity that is convertible into millivolts can be measured by means of Speedomax recorders, which are manufactured by the Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. The measurement of speed, electrical frequency, and temperatures, and the counting of objects are a few of the possibilities of these recorders. It is claimed that these instruments are ten times faster than the usual potentiometer instrument. They are designed for use under the roughest plant conditions.

The illustration shows a Speedomax recorder arranged as a radiation pyrometer for measuring the temperature of steel as it passes through the rolling mills between stands or after the final pass. This instrument operates so fast that in two seconds the recording pen moves across the entire width of the 9 7/8-inch chart, and comes to a balance. It is fast enough to record the temperature drop due to water spray on the hot steel during a temporary pause when the roll table speed is not synchronized with the speed of the roll.



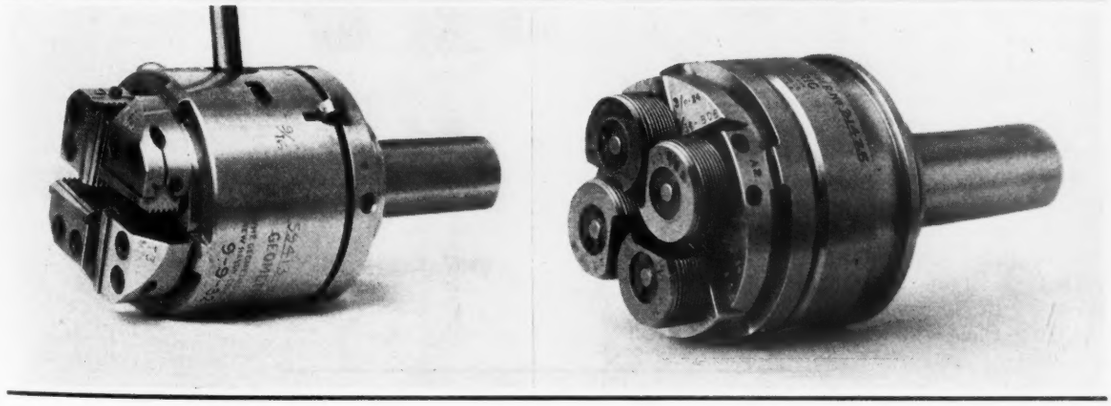
Instrument for Recording the Temperatures of Steel while being Worked

Geometric Die-Head that Takes Circular or Tangent Chasers

Circular and tangent chasers can be used interchangeably in a combination die-head that has been added to the line of the Geometric Tool Co., New Haven, Conn. This die-head is hardened and ground throughout. It has been brought out after months of development to make the Geometric die-head construction available to those who favor the use of either circular or tangent chasers for long runs of identical threads.

In addition to chaser interchangeability, many other new features are incorporated in this tool. The chasers and holders can be extracted without removing the die-head from the machine, then ground, set, and replaced in the head in minimum time. The chasers can also be removed from the holders and accurately ground in a Geometric fixture that is adapted for use on any universal surface grinding machine.

The circular chaser has a series of serrations for coarse adjustment, but any desired degree of adjustment between serrations is also provided. The tangent chaser has an equally minute adjustment. In resharpening, only enough metal need be ground off either type of chaser to leave a clean cutting edge, which greatly lengthens the chaser life. A rigid chaser-holder support with broad



Combination Die-heads in which Circular or Tangent Chasers can be Used Interchangeably

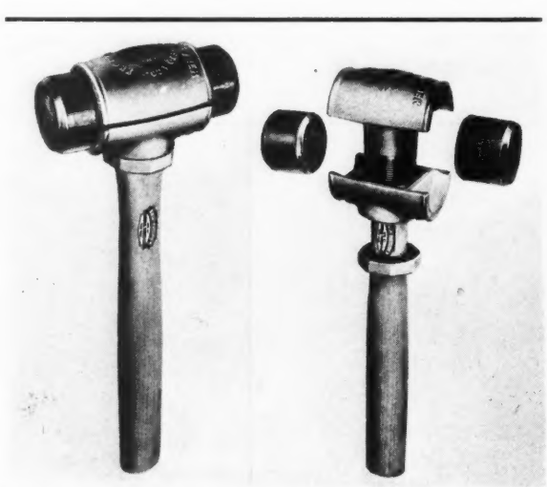
reinforcing wings; a post support for the circular chaser which is integral with the holder; and an improved four-point bearing for the tangent chaser are other important details.

The principal feature of one of the company's line of die-heads is retained: The front plates that help to form the T-slots which support the chaser-holders are removable and replaceable in case of wear. This feature greatly lengthens the life of the tool. Broad locking surfaces that hold the chasers in the cutting position, positive tripping and adjusting means, and a simple provision for disassembling the head for cleaning are other design features that have been retained in the new die-head. In die-heads of both the rotary and the stationary types, either tangent or circular chasers can be used. The helix can be either in the chaser or in the holder.

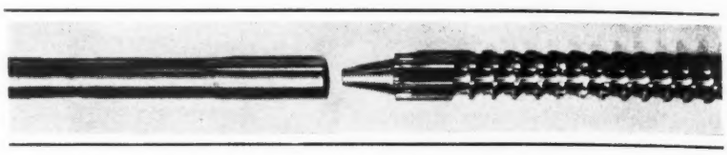
Basa Hammer with Adjustable Rawhide Faces

A "Basa" hammer provided with adjustable rawhide faces that cannot drop out due to shrinkage is being placed on the market by Greene, Tweed & Co., 109 Duane St., New York City. The illustration shows how this hammer is constructed. The adjustable metal head holds the rawhide faces firmly, the jaws of the head being recessed, so that the rawhide faces are slightly mushroomed at the back when the jaws are tightened. This construction prevents the rawhide faces from falling out of the head.

When the rawhide faces become worn, they can be replaced by refills at small expense, so that the hammer can be kept in first-class condition. Care is taken in selecting the rawhide and in manufacturing the faces to obtain a hammer having the proper firmness and resiliency so that the blows necessary in assembling and other machine shop operations can be struck without denting or otherwise marring finished surfaces. The hammer is balanced to insure well measured blows. The handle is made of straight-grained hickory.



Basa Hammer with Adjustable Rawhide Faces that Cannot Drop Out



Detachable Broach Shank Recently Designed by the American Broach & Machine Co.

American Detachable Broach Shanks

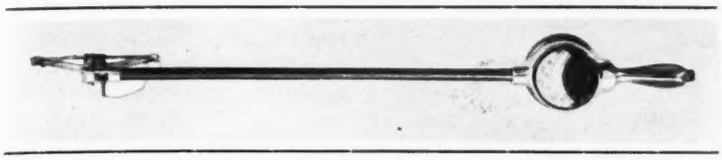
Detachable broach shanks of a new design have been placed on the market by the American Broach & Machine Co., Ann Arbor, Mich. As will be seen in the illustration, broaches on which this shank is to be used are made with a threaded conical end that is steeply tapered. The thread is of a modified square type, the bottom and top sloping at the same angle, while the sides are vertical. The shank is threaded to correspond. The design of the thread is such that when the shank is screwed on the broach, it accurately centers itself in relation to the broach.

One of the advantages claimed for these detachable shanks is that they permit substantial savings to be made, since they can be used over and over again when worn out broaches are replaced by new tools. Also, they facilitate the regrinding of broaches, because they can be removed for such operations, thus reducing the length of the tool and eliminating chatter or whip. These detachable shanks can be supplied in various sizes. Tests have shown that they will withstand severe strains in service.

Pyrometer for Revolving Rolls

A pyrometer designed for determining surface temperatures of revolving rolls and cylinders has been devised by the Illinois Testing Laboratories, Inc., 141 W. Austin Ave., Chicago, Ill. As will be noted from the illustration, this unit is self-contained, the indicator being mounted in a supporting arm which also holds the thermo-couple.

The thermo-couple consists of a ribbon or flat-strip wire which is placed directly in contact with the revolving roll. It is held in a bow-shaped device which provides a suitable tension to enable the thermo-couple to be used on rolls of any diameter. A grooved carbon block regulates



Pyrometer for Determining the Surface Temperature of Revolving Rolls, Cylinders, and Similar Parts

the maximum pressure that can be exerted on the thermo-couple against the roll.

The arm of this pyrometer can be made any length up to 48 inches. The indicator can be graduated from 0 to 600, 800, or 1000 degrees F. This pyrometer is particularly suitable for use in steel plants, paper mills, and rubber factories.

Oxweld "Pantosec" Cutting Machine

A stationary machine that is especially suitable for cutting dies, cams, and other parts to accurate shape has been added to the Oxweld line of welding and cutting apparatus manufactured by the Linde Air Products Co., 30 E. 42nd St., New York City. This machine has a cutting range of 44 inches longitudinally and 20 inches laterally, and occupies a floor space of only 72 by 83 inches. It will cut to straight lines, angles, circles, and intricate shapes, and will also bevel edges.

The "Pantosec," as the equipment is called, can be operated from either the templet end or the blow-pipe end, and either as a hand-guided or automatically guided machine. Angles can be cut without templets, since the cutting head can be locked to travel in any direction. One of the features of the machine is that the blow-pipe can be lined up without shifting the work. The dividing head enables the operator to set stops on work that is to be cut in several directions.

Townsend Pointing, Shaving, and Drilling Machine

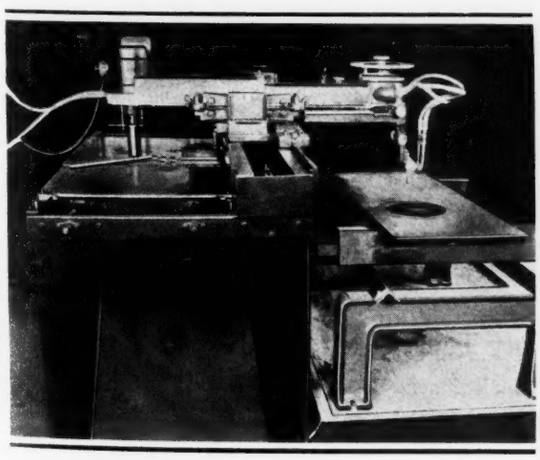
The latest machine to be developed by the H. P. Townsend Mfg. Co., Hartford, Conn., for drilling, pointing, forming, or shaving either end of blanks previously headed or produced in screw machines is shown in the illustration. The hopper feed of this machine can also be arranged to handle a large variety of work besides ordinary screw blanks. Tubes and shells can be handled for trimming, rolling, or knurling operations.

The blanks are picked up by the well-known rise-and-fall type of hopper blade and passed down a short straight track to a carrier segment which carries them to feed-fingers. The feed-fingers bring the blank down into line with the spindle and move sidewise to insert it in the jaws. The forming tool and the drill are brought up to the work to operate together or independently. The work revolves in one direction and the drill in the opposite direction so that high spindle speeds are not necessary. The work is supported by a back-rest which also provides for centering the drill by means of a bushing.

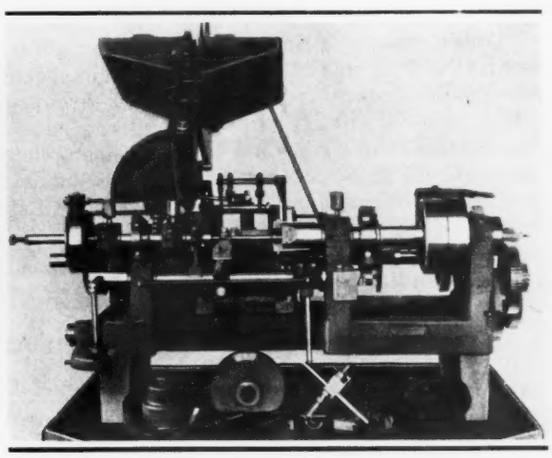
The drill and forming tool are fed by cams. The cams can be changed quickly, since both are mounted on the end of a shaft outside of the bearing. This machine is built in three sizes for taking light cuts at high production rates. The No. 3 will handle blanks up to 5 inches long by 5/8 inch in diameter. Production on the smaller blanks will run as high as sixty pieces a minute.

Gall-Proof High-Temperature Lubricant

A metallic-lead thread lubricant recently placed on the market by the Armite Laboratories,



The "Pantosec"—a Precision Shape-cutting Machine



Townsend Pointing, Shaving, and Drilling Machine

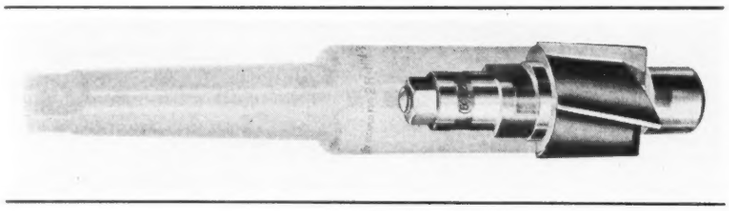


Fig. 1. Eclipse Counterbore with Two Radial Driving Faces

1900 E. 65th St., Los Angeles, Calif., is claimed to be particularly advantageous in assembling machinery and in repairing equipment that is subject to heavy duty, high temperatures, and general abuse. This lubricant is a finely divided metallic lead in paste form. In use, a film of metallic lead is formed between threads, so as to prevent galling and speed up repair work. Pipe threads to which the lubricant has been applied will not corrode, because the lead does not oxidize or harden.

The lubricant may be used on flywheels and similar parts to facilitate their assembly or removal. It may also be used to improve press operations. Heat of a bright red will not harden or destroy the compound.

Eclipse Radial-Drive Counterbores

Two radial driving faces are the feature of a line of "Super Strength" counterbores being introduced on the market by the Eclipse Counterbore Co., 7410 St. Aubin Ave., Detroit, Mich. As may be seen in Fig. 2, these two driving faces coincide with a line passing directly through the center of the holder and the cutter shank. Thus, only a radial or turning action can occur when the tool is being driven, with the result that the holder cannot wedge or split.

The phantom view reproduced in Fig. 1 shows that the driving action is applied close to the cutting edges of the tool. The driving faces are integral on both the cutter shank and the holder, and these parts are hardened and ground throughout. Two cylindrical surfaces on the cutter shank, one above and the other below the driving lugs, together with a ground thrust bearing, maintain the concentricity of the assembled tool. A simple internal lock retains the cutter positively in the driving position.

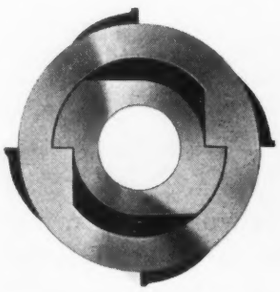


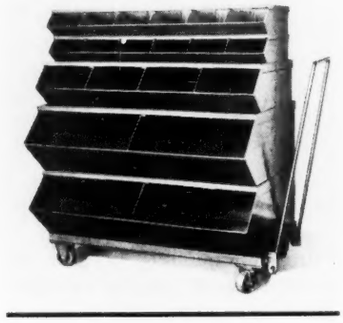
Fig. 2. Driving Faces of the New Eclipse Counterbore

These radial-drive counterbores supplement the pin-drive tools made by the same concern. The blades of the counterbores of the new line are 1/8 inch longer than on the pin-drive line, but the pilots of both types are interchangeable. Larger pilot holes are provided in the new cutters, size for size, so that stronger pilots can be employed. The radial-drive counterbores are made in all standard and special sizes from 3/4 to 4 1/2 inches in diameter.

Stackbin Assembly Truck

Sheet-metal bins stacked compactly on a metal truck, as shown in the illustration, constitute a recent development of the Stackbin Corporation, Providence, R. I. This truck is intended for use when a considerable number of parts are to be assembled into machinery and other mechanical products. The truck consists of an angle-iron platform with two swivel casters and two casters of the stationary type.

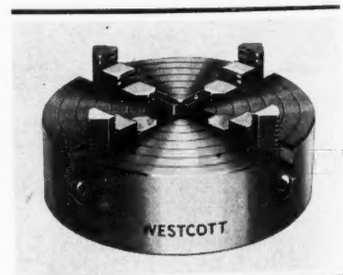
Bin sections of large size are placed on the truck first and then the smaller sections in order of size. In this way, a truck with graduated storage compartments becomes available. It is intended that bulky castings be placed in the large compartments, smaller machine parts in the intermediate compartments, and such items as screws, nuts, bolts and cotter-pins in the small sections at the top.



Truck of Stack Bins to Facilitate Assembly

Westcott Light-Duty Independent Lathe Chuck

Strength, lightness, and minimum overhang consistent with good engineering practice are the



Westcott Chuck for Light-duty Lathes

features claimed for the light-duty independent lathe chuck here shown, which is a recent product of the Westcott Chuck Co., 322 E. Walnut St., Oneida, N. Y. In designing this chuck, the thought was kept in mind that a thick heavy chuck mounted on a small-diameter spindle produces injurious chatter, and so the chuck was designed for successful use on so-called "light-duty" lathes of all kinds.

The body is constructed of high-strength, close-grained nickel iron, and is made in one piece. The jaws are of casehardening steel. They are hand-fitted to the body and have raised and ground steps. When mounted on a true spindle with a true adapter, the jaw steps show a longitudinal run-out of less than 0.001 inch. The long end of each jaw is serrated, so that when the jaws are reversed, they will grip bars, etc.

The jaw screws are threaded for their full length, except where they are necked for the bearings. They have mortised heads to take a square-end, T-handle wrench. The steel used in these screws is of a quality which insures that the mortised heads will not break out. The sizes now available include 3, 4, 5, and 6 inches.

Marble-Card Capacitor Motors

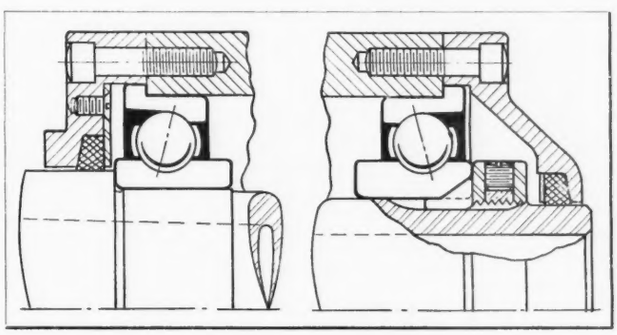
A line of single-phase motors of the capacitor type has recently been developed by the Marble-Card Electric Co., Gladstone, Mich. These motors are similar in construction to a two-phase squirrel-cage motor with a condenser connected across one phase for starting. The condenser is automatically cut out of the circuit by a simple contactor when the motor comes up to speed. The condenser and contactor are mounted in a sheet-metal box known as the "starting unit." This unit can be mounted on an adjacent wall, as illustrated.

Marble-Card Capacitor Motor and Starting Unit

New Departure Flanged Precision Spindle Bearings

A line of precision ball bearings that are flanged for use on spindles is being introduced on the market by the New Departure Mfg. Co., Bristol, Conn. The following advantages are claimed for the bearings of this new line: (1) The shoulders are on the bearing instead of in the housings. (2) Because of the construction it is possible to bore the housings straight through in one set-up, thereby insuring true alignment. (3) The bearings are separable for quick assembly. (4) The inner rings are made extra wide, in order to insure a non-deflecting seat, and they are keyslotted, so that they can be locked to prevent creeping around the shaft. Preloading is applied through the inner rings.

These bearings are supplied in bore sizes from 30 millimeters (1.1811 inches) up to 130 millimeters (5.1181 inches) to precision specifications. Two bore sizes are obtainable for each standard outside diameter.



Flanged Spindle Bearings Designed to Permit the Housings to be Bored Straight Through

* * *

Board to Administer Machine Tool Code

At the annual convention of the National Machine Tool Builders' Association, held in Washington late last month, the following permanent supervisory agency to administer the code of the machine tool and forging machinery industry was elected: Henry Buker, vice-president, Brown & Sharpe Mfg. Co., Providence, R. I.; James E. Gleason, president, Gleason Works, Rochester, N. Y.; H. M. Lucas, president, Lucas Machine Tool Co., Cleveland, Ohio; Robert M. Gaylord, president, Ingersoll Milling Machine Co., Rockford, Ill.; August H. Tuechter, president, Cincinnati Bickford Tool Co., Cincinnati, Ohio; W. E. Whipp, president, Monarch Machine Tool Co., Sidney, Ohio; and Herman H. Lind, general manager, National Machine Tool Builders' Association, Cleveland, Ohio.

At the meeting the following new directors were elected: Geo. H. Benzon, Jr., vice-president, William Sellers & Co., Inc.; George H. Johnson, president, Gisholt Machine Co.; and Norman D. MacLeod, treasurer, Abrasive Machine Tool Co.

Norton Co. Holds an Extensive Exhibition

During the week of December 4, the Norton Co. Worcester, Mass., held a large exhibition of grinding and lapping equipment at its Worcester plant. The exposition was one of the most comprehensive showings ever made by the company, occupying, as it did, 7500 square feet devoted to the exhibition of machinery, all of which was in actual operation.

Eight of the machines shown were new and were introduced to the industry at this show; six of these were illustrated and described in MACHINERY, December, 1933, beginning on page 235. In addition, the entire line of the company's product was on exhibit. The show was attended by about 350 visitors from many of the largest plants in the United States. Representatives of the Japanese Government and of Soviet Russia were also present.

* * *

Steel Foundry Code

Following the approval by the President of the code of fair competition for the steel casting industry, representatives of the industry met in Cincinnati, T. H. Harvey, president of the Steel Founders' Society of America, presiding. This was the largest assemblage of steel foundry men in the history of the industry, more than one hundred firms being represented, producing 85 per cent of the tonnage of the country. The administration of the code is under the direction of the board of directors of the Steel Founders' Society, composed of district representatives from eight geographical divisions of the country. The meeting adopted a resolution expressing its conviction that operation under the industry code will have most favorable results and will stabilize both labor and marketing conditions.

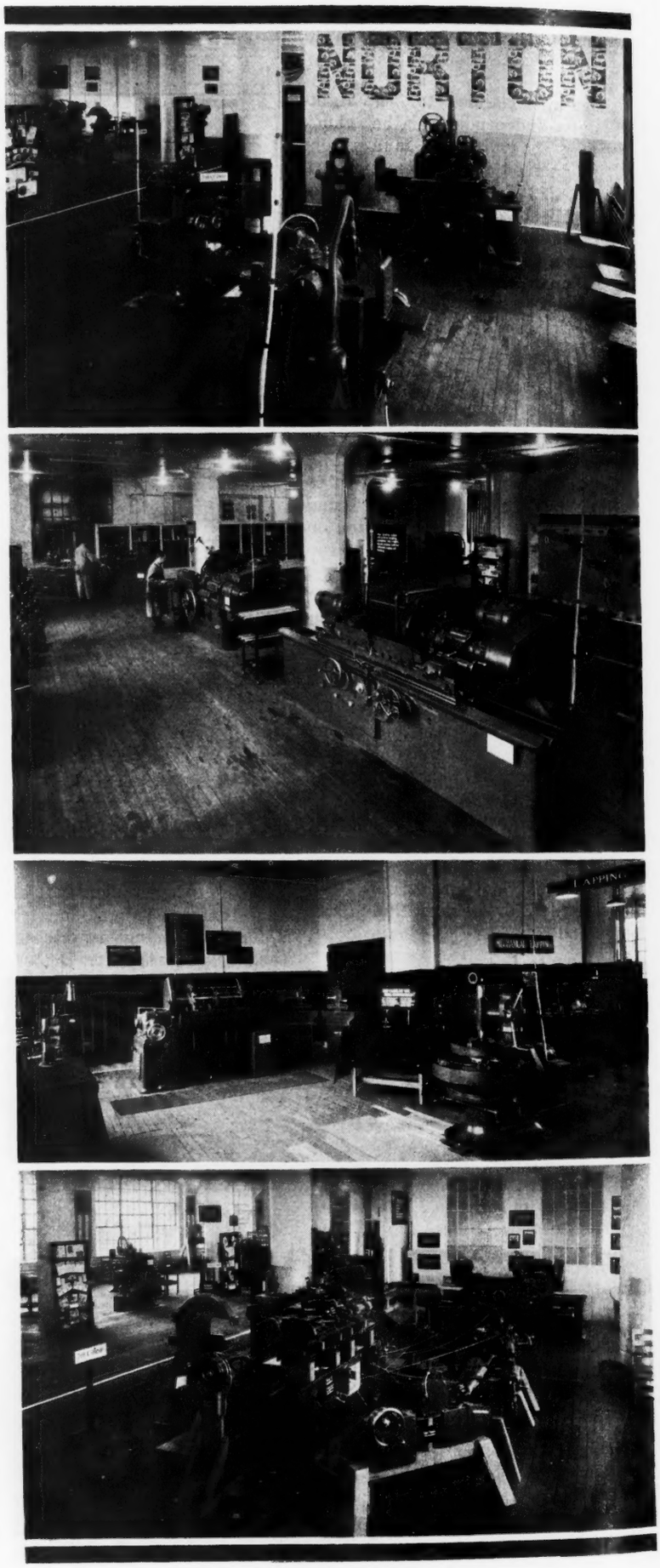
* * *

The NRA and the Export Trade

More than sixty industries in the United States engaged in the exporting business have approved conditions worked out by the National Recovery Administration under which exporting industries shall be exempt from NRA code provisions, according to a statement by the National Export Code Committee headed by E. P. Thomas, president of the National Foreign Trade Council. Complete information pertaining to this subject can be obtained by addressing Gardner L. Harding, secretary, National Foreign Trade Council, India House, Hanover Square, New York City.

* * *

Previous depressions have taught us that there can be no complete recovery until the capital goods industries have been restored to a healthy condition. Producers must be supplied with new capital with which to purchase machinery, equipment, and supplies.—*John W. O'Leary, President, the Machinery and Allied Products Institute.*



NEWS OF THE INDUSTRY

Illinois and Missouri

JOSEPH T. RYERSON & SON, INC., 16th and Rockwell Sts., Chicago, Ill., report that the sales for the last six months of 1933 were about 50 per cent greater than for the same period in 1932. This company is one of the few concerns that are extending their facilities at this time. An extensive addition to its St. Louis steel service plant is under way. The new building will greatly increase the facilities for storing and dispatching steel and allied products from that point. Modern offices equipped with an air conditioning and cooling system will be included in the unit. The greater part of the new addition will be given over to the warehousing of products requiring special protection from atmospheric changes. A circulating warm air heating system will provide the necessary distribution of heat for the proper storing of sheets, tool steels, welding rod, cold-rolled bars, bands, hoops, and other high-grade steels.

W. A. NUGENT has been appointed sales manager of the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. Mr. Nugent, who was formerly district manager of the Chicago territory, has been with the company for nineteen years, having served as St. Louis branch manager and as assistant to the president. He will have charge of all pneumatic and electric tool sales.

DEAN MACHINERY CO., INC., 80 E. Jackson Blvd., Chicago, Ill., has been appointed exclusive agent for the MICHIGAN TOOL CO., Detroit, Mich., in the Chicago territory, to handle that company's line of gear finishing machines, gear lapping machines, involute testing machines, spiral lead checking machines, and other gear-checking equipment.

WALTER E. PETERSEN, formerly with the Magnolia Metal Co., is now associated with the Chicago plant of the United American Metals Corporation in the capacity of manager of the babbitt metal department. Mr. Petersen will devote his attention to the introduction of babbitt metal in bushing form.

THELANDER & BERG, industrial designing stylists, have removed to Suite 504 in the Swedish-American Bank Bldg., Rockford, Ill. The organization collaborates with a number of nationally known manufacturers in the styling and designing of new products.

JOSEPH T. RYERSON & SON, INC., 16th and Rockwell Sts., Chicago, Ill., have purchased the stock and good will of BACON & CO., an iron and steel concern of Boston, Mass.

E. N. CARLSON, recently connected with the Corby Supply Co., and for many years previously with Joseph T. Ryerson & Son, Inc., has become associated with Guy H. Rumpf, Railway Exchange Building, St. Louis, Mo., handling a general line of machine tools, welding equipment, industrial tractors and trucks, and steel. Mr. Rumpf represents the following companies: Bryant Machinery & Engineering Co., Mercury Mfg. Co., Acme Steel Co. and Detroit Seamless Steel Tube Co.

Michigan and Wisconsin

NATIONAL ASSOCIATION OF FAN MANUFACTURERS announces the opening of an office at 5-208 General Motors Bldg., Detroit, Mich., for the purpose of coordinating the activities of the members under the National Recovery Act. L. O. Monroe, who has been identified with the industry since 1911, will have charge of the new office.

EZRA W. CLARK, vice-president of the Clark Tructractor Co., Battle Creek, Mich., has been elected president of the Gas-Powered Industrial Truck Association, which has headquarters at 60 E. 42nd St., New York City. The Association is a member of the Machinery and Allied Products Institute.

EX-CELL-O AIRCRAFT & TOOL CORPORATION, Detroit, Mich., reports that the company's December shipments are approximately double the shipments for December last year, while November shipments were more than double those of a year ago. The company will show a satisfactory profit for the last quarter of the year.

CHARLES F. NORTON, formerly vice-president and general manager of the Howell Electric Motors Co., Howell, Mich., who recently became associated with the Louis Allis Co. of Milwaukee, Wis., has been appointed general sales manager of that company.

New Jersey

R. W. MITCHELL, technical director of the Dif Corporation and the Magnus Chemical Co., Inc., South Ave., Garwood, N. J., sailed on December 16 on the *Ile de France* for a six weeks' business trip to England, France, and Italy. Mr. Mitchell will visit industrial plants and make a study of cleaning equipment, materials, and methods in use among the leading European manufacturers of metal goods and allied lines.

CHAIN BELT CO., Milwaukee, Wis., has appointed DALE & RANKIN, INC., Newark, N. J., distributors for the Rex line of construction equipment.

New York

JOHN M. LLOYD, who was associate mechanical editor of the *Iron Age* from 1911 to 1918, has become associated with KELLOGG & TREE, 300 Madison Ave., New York City, as manager of the trade and consumer publicity department. After resigning from the *Iron Age*, he was head of the publication department of the Society of Automotive Engineers for over fourteen years. Kellogg & Tree are engaged in industrial sales promotion work, and handle the entire selling problem of their clients, including the appointment and supervision of jobbers, agents, and salesmen, and the preparation of advertising and publicity.

MORSE CHAIN CO., Division of the Borg-Warner Corporation, Ithaca, N. Y., has acquired the Kelpo free-wheeling or one-way industrial clutch, previously manufactured by the Kelpo Clutch Co. of Rockford, Ill. In the future, the Kelpo clutch will be manufactured at the Ithaca plant of the Morse Chain Co. and will be sold by the Morse Chain Co.'s representatives. Fred M. Potgieter, formerly president of the Kelpo Clutch Co., has joined the Morse organization.

ATLANTIC GEAR WORKS, INC., announce that their entire manufacturing plant and office have been removed to New York City. The new quarters provide double the floor space of the old factory. The office is located at 128 Lafayette St., New York City, and the factory a few blocks distant.

HOWARD COONLEY, president of the Walworth Co., New York City, has been re-elected president of the American Standards Association for 1934.

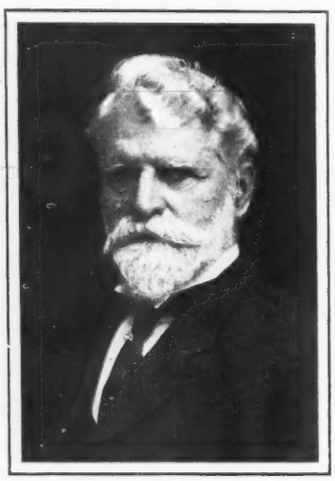
Ohio

THE CINCINNATI MILLING MACHINE CO., Oakley, Cincinnati, Ohio, has concluded arrangements for building certain types of milling machines in Great Britain. Machine units and parts will be supplied from Cincinnati and incorporated in the finished machines built by Cincinnati Milling Machines, Ltd. Formation of this new company has been announced in London by J. B. S. Gabriel, chairman of the board. Mr. Gabriel stated that a modern factory would be established in Birmingham, providing close contact with the principal motor-car manufacturers and other production industries. The distribution of both the

Cincinnati-built and British-built machines will be handled by Charles Churchill & Co., Ltd., who introduced Cincinnati millers to British industry many years ago. The Cincinnati centerless grinder is another development of the company now being manufactured in Great Britain.

HARRY W. MCQUAID has joined the metallurgical staff of the Republic Steel Corporation, Youngstown, Ohio. Mr. McQuaid is known as an authority on carburizing steels and casehardening methods, and is one of the pioneers in grain size control, having collaborated in the development of the McQuaid-Ehn test. He will devote his time to research and development work. Other changes in the metallurgical staff include the transfer of HOWARD W. BURKETT from Youngstown to Buffalo; the appointment of ELMER LARNED as metallurgical engineer in the Chicago district; and the acquisition of HAROLD T. BLAIR, who will specialize in tin plate products. KARL KAUTZ, ceramic engineer, has also joined the Republic organization and will specialize in research and field service on enameling sheets.

AMBROSE SWASEY, dean of engineers and machine tool builders, and chairman of the board of the Warner & Swasey Co., Cleveland, Ohio, has been awarded the Gold Medal of the American Society of Mechanical Engineers for 1933 for his contributions to the advancement of the engineering profession and for his part in the development of the turret



Ambrose Swasey, who was Recently Awarded the Gold Medal of the A.S.M.E.

lathe and the astronomical telescope. This is the highest honorary award that can be conferred by the Society on an engineer.

C. L. ANGER has joined the Udylite Process Co., Detroit, Mich., manufacturer of rustproofing and electroplating equipment. Mr. Anger's headquarters will be at the recently established Cleveland branch office of the company. He has had a wide experience in the plating industry, and has been connected with several plating concerns. For the last few months, he has been working on special plating problems in the Udylite laboratories.

C. L. Anger, Now Associated with the Udylite Process Co.

C. C. SNYDER of the Central Alloy Division of the Republic Steel Corporation, Massillon, Ohio, recently delivered a talk entitled "Industrial Uses of Stainless Steel" before a meeting of the American Society of Mechanical Engineers at Cincinnati, Ohio. Prefacing his address with a brief history of the development of stainless steel, Mr. Snyder then discussed the general characteristics and properties of the different types. The latter part of the talk stressed the rapidly increasing use of stainless steel in various industries. Lantern slides were used to illustrate a number of typical installations of Enduro stainless steel.

T. H. DOAN has been elected president of the Foote-Burt Co., Cleveland, Ohio, manufacturer of drilling machines and special machinery, to fill the unexpired term of George E. Randles, who recently passed away. R. E. DELAMATER and W. F. BABCOCK were elected vice-presidents, and T. F. JONES was elected a director to fill the unexpired term of Mr. Randles.

UDYLITE PROCESS CO., Detroit, Mich., manufacturer of rustproofing and electroplating equipment, announces the opening of a new sales and service branch at 708 Keith Bldg., Cleveland, Ohio. J. S. HOFFMAN will be in charge of the new branch, and will have as assistants L. J. GEORGE and C. L. ANGER.

Pennsylvania

FRANK CONRAD, assistant chief engineer of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., was recently awarded the John Scott Medal for scientific achievements by the City of Philadelphia. The John Scott Medal is awarded for inventions that will be useful to mankind in the development of industry in any form, the test being that the invention may add to the comfort, welfare, and happiness of mankind. Dr. Conrad has been honored previously for his achievements in radio. In 1928 the University of Pittsburgh presented him with the degree of Doctor of Science, and in 1920 he was recipient of the Edison Gold Medal for outstanding accomplishments in electrical engineering.

HARRY K. RUTHERFORD, for a number of years export manager, and more recently sales manager, of the Industrial Division of Henry Disston & Sons, Inc., Philadelphia, Pa., manufacturers of saws, tools, files, knives, and steel, has been appointed manager of a newly established branch of the Sales Analysis Institute, Buffalo, N. Y., which will be opened shortly in Philadelphia. The Institute has developed a method of analyzing products, charting sales points, and coaching salesmen with a view to helping sales managers increase the effectiveness of their salesmen.

AMERICAN SOCIETY FOR TESTING MATERIALS has moved its headquarters from the Engineers Club Bldg., at 1315 Spruce St., Philadelphia, Pa., where the Society has been located for fourteen years, to more adequate accommodations in the Atlantic Bldg., 260 S. Broad St., Philadelphia.

AMERICAN GEAR MANUFACTURERS' ASSOCIATION has moved its offices from the First National Bank Bldg., Wilkinsburg, Pa., to the Penn-Lincoln Hotel of the same city. This is also the headquarters of the Code Authority of the gear-manufacturing industry.

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The Leipzig Spring Fair

The 1934 Leipzig Spring Fair will be held from March 4 to March 11, at which an extensive machinery exhibit is expected. Counting all classes of exhibits in every industrial field, seven thousand firms will be represented, the exhibits originating from twenty-two countries. Ordinarily, the fair is visited by some 150,000 people. It is estimated that the 1934 Spring Fair will be three times as large as any pre-war fair. Further information can be obtained from the Leipzig Trade Fair, Inc., 10 E. 40th St., New York City.

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The output of automobiles by the members of the National Automobile Chamber of Commerce for the first eleven months of the year was 1,451,363 cars and trucks, as compared with 893,095 during the first eleven months of 1932. These figures do not include the Ford output.